VOLUME 12 NUMBER 22 / NOVEMBER 23, 1974

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N74-32408 Engineering Sciences Data Unit, London (England).
[WIND TUNNEL INVESTIGATIONS]
Aug. 1974 1 p refs Reprinted
(ESDU-Flaps-01.01.09) Copyright. Avail: Issuing Activity

The lift coefficient increment due to flap deflections of 20 degrees and 40 degrees is determined mathematically. The aerodynamic configuration is a part-span double-slotted flap on a rectangular wing. The flap is located between 12 percent and 60 percent of each semispan. Mathematical models of the numerical procedure are included. Author

N74-32409 Engineering Sciences Data Unit, London (England).
RATE OF CHANGE OF LIFT COEFFICIENT WITH CONTROL DEFLECTION FOR FULL-SPAN PLAIN CONTROLS
Jul. 1974 8 p refs Supersedes ESDU-Aero-C.01.01.06 Sponsored by Roy. Aeron. Soc.
(ESDU-74011; ESDU-Aero-C.01.01.06) Copyright. Avail: Issuing Activity

Tests were conducted to determine wing flap effectiveness in terms of the wing lift-curve slope, the wing and flap geometry, and free-stream Mach number for full-span plain flaps on straight-tapered wings having a constant flap chord/wing chord ratio along the span and no gap between the wing and flap. The presentation is based on lifting-surface calculations, with corrections for wing thickness and Reynolds number. The data are applicable to subcritical wing flow and only to the linear part of the flap characteristic. A mathematical model is developed to show the rate of change of lift coefficient with flap deflection. Author

N74-32410 Engineering Sciences Data Unit, London (England).
CONVERSION OF LIFT COEFFICIENT INCREMENT DUE TO FLAPS FROM FULL SPAN TO PART SPAN
Jul. 1974 7 p refs Supersedes ESDU-Aero-F.01.01.07 Sponsored by Roy. Aeron. Soc.
(ESDU-74012; ESDU-Aero-F.01.01.07) Copyright. Avail: Issuing Activity

Mathematical relationships are developed for the lift coefficient increment due to part-span flaps are developed in terms of the corresponding full-span lift coefficient increment at the same flap deflection. The data are based on calculations for straight-tapered wings with plain flaps using lifting-surface theory. A specific example of the method used to obtain the numerical solution is included. Author

N74-32411*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CALCULATIONS OF THE PRESSURE DISTRIBUTION ON AXISYMMETRIC BOATTAILS INCLUDING EFFECTS OF VISCOUS INTERACTIONS AND EXHAUST JETS IN SUBSONIC FLOW
Josef Rom (Technical - Israel Inst. of Tech., Haifa) and Lawrence J. Bober Washington Sep. 1974 22 p refs
(NASA-TM-X-3109; E-7811) Avail: NTIS HC $3.00 CSCL 01A

A method of calculating the pressure distributions on boattails is proposed. This method accounts for viscous effects including the presence of a separated region for base flows by combining an inviscid analysis with a boundary layer analysis in an iterative calculation. Details of the reversed flow region are not considered. Some preliminary results have been obtained for boattails at subsonic free stream Mach number with turbulent boundary layers separating at the boattail base. In some cases convergence could not be obtained using the present computer program. It is possible, in principle, to extend this method to the calculation of boattail flows with pressure gradient induced separation on the boattail. Author

N74-32412*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE EFFECT OF CANARD AND VERTICAL TAILS ON THE AERODYNAMIC CHARACTERISTICS OF A MODEL WITH A 59 DEG SWEPTBACK WING AT A MACH NUMBER OF 0.30
William P. Henderson Washington Sep. 1974 35 p refs
(NASA-TM-X-3088; L-9662) Avail: NTIS HC $3.25 CSCL 01B

An investigation has been conducted to determine the effects of canard, canard location, vertical tails, and vertical-tail location on the aerodynamic characteristics of a model having a 59 deg sweptback wing. The investigation was conducted at a Mach number of 0.30, at angles of attack up to 22 deg and at sideslip angles of 0 deg and plus or minus 5 deg. The results of the study indicate that adding the canard to the model had only a slight effect on the lift at the lower angles of attack. At the higher angles of attack there is a significant effect of canard height on lift, canard in the high location (above the wing chord plane) resulting in the highest lifts. The lift drag characteristics are predicted well for the configuration with the mid or high canard locations by combining a potential flow solution on the canard with a potential plus vortex solution on the wing. Variations in the height significantly affect the pitching-moment characteristics of the configuration; the configuration with the low or mid canard location exhibits an increase in stability at the higher lift coefficients, whereas the configuration with the high canard exhibits pitch-up. Adding the vertical tails in the outboard location caused a significant loss in lift at the higher angles of attack; this lift loss was eliminated by moving the vertical tails inboard. Author

N74-32413*# Flow Research, Inc., Kent, Wash.
A VISCOUS POTENTIAL FLOW INTERACTION ANALYSIS METHOD FOR MULTI-ELEMENT INFINITE SWEPT WINGS, VOLUME 2
F. A. Dvorak and F. A. Woodward Apr. 1974 126 p
(Contract NAS2-7048)

(NASA-CR-137550; Rept-20) Avail: NTIS HC $9.50 CSCL 01A

The program input and output are described, and the program listing is presented. A sample program output for an infinite swept wing calculation is shown. F.O.S.

N74-32414*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SUBSONIC ANNULAR WING THEORY WITH APPLICATION TO FLOW ABOUT NACELLES
Michael J. Mann Washington Sep. 1974 93 p refs
(NASA-TN-D-7630; L-9274) Avail: NTIS HC $4.00 CSCL 01A

A method has recently been developed for calculating the flow over a subsonic nacelle at zero angle of attack. The method makes use of annular wing theory and boundary-layer theory and has shown good agreement with both experimental data and more complex theoretical solutions. The method permits variation of the mass flow by changing the size of a center body. Author

N74-32415*# Chrysler Corp., New Orleans, La. Space Div.
DETERMINATION OF AERODYNAMIC STABILITY AND DRAG OF THE TITAN 3C SRM DURING ENTRY
Paul E. Ramsey (NASA. Marshall Space Flight Center) Jul. 1974 320 p
(Contract NAS9-13247)
(NASA-CR-134402; DMS-DR-2142) Avail: NTIS HC $19.00 CSCL 01A

An experimental aerodynamic investigation was conducted in the NASA/MSFC 14-inch Trisonic Wind Tunnel on a 0.00736 scale model of Titan 3 C Solid Rocket Motor (SRM). Static stability and drag data were obtained for Mach numbers of 0.6 to 4.96, angles of attack of minus 10 deg to 190 deg, and roll angles of 0 to 360 deg. The resulting data will be used to predict the dynamic motions of the SRM during entry which will then be compared to flight data. This comparison will improve and lend credibility to methods for predicting the entry dynamics of the space shuttle Solid Rocket Booster (SRB), which is needed for recovery studies and design of the parachute recovery system. Author

N74-32416*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A STREAMLINE CURVATURE METHOD FOR DESIGN OF SUPERCRITICAL AND SUBCRITICAL AIRFOILS
Raymond L. Barger and Cuyler W. Brooks, Jr. Washington Sep. 1974 16 p refs
(NASA-TN-D-7770; L-9747) Avail: NTIS HC $3.00 CSCL 01B

An airfoil design procedure, applicable to both subcritical and supercritical airfoils, is described. The method is based on the streamline curvature velocity equation. Several examples illustrating this method are presented and discussed. Author

N74-32417# Mississippi State Univ., State College. Dept. of Aerophysics and Aerospace Engineering.
THREE-DIMENSIONAL MEASUREMENTS OF THE VELOCITY IN THE NEAR FLOW FIELD OF A FULL-SCALE HOVERING ROTOR Interim Report
Donald W. Boatwright Jan. 1974 150 p refs
(Contract DAHC04-68-C-0003)
(AD-781547; EIRS-ASE-74-4; AROD-T-3-27-E) Avail: NTIS CSCL 01/1

An experimental investigation of the flow field of a hovering helicopter rotor was initiated at Mississippi State University in 1970. The initial results of this work were reported in USAAMRDL TR 72-33. The current report presents additional experimental results obtained during a continuation of the rotor flow study. The experimental measurements were performed on the Mississippi State University rotor whirl tower which was equipped with a 33.5-foot diameter, OH-23B two-bladed rotor. The measurements consisted primarily of velocity surveys of the rotor inflow and wake with measurements below the rotor being confined to the region just below the blades. Some experiments were also performed to determine boundary layer flow phenomena by use of the chemical sublimation technique. (Modified author abstract) GRA

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N74-32418* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NOISE SUPPRESSOR Patent
William E. Zorumski, inventor (to NASA) Issued 20 Aug. 1974 13 p Filed 14 May 1973 Supersedes N73-22975 (11 - 14, p 1600)
(NASA-Case-LAR-11141-1; US-Patent-3,830,335; US-Patent-Appl-SN-359957; US-Patent-Class-181-33F; US-Patent-Class-181-33C; US-Patent-Class-181-33H; US-Patent-Class-181-33L; US-Patent-Class-181-42) Avail: US Patent Office CSCL 20A

A tuned noise suppressor is described consisting of annular acoustically porous elements for incorporation into the inlet and exhaust ducts of turbofan engines. The apparatus uses sound wave absorption, reflection, and incompatibility for achieving high noise reduction in the short distance. In addition, it has a duct of uniform inner diameter which does not block the duct flow. Official Gazette of the U.S. Patent Office

N74-32419*# Kanner (Leo) Associates, Redwood City, Calif.
BRAKING PERFORMANCE
G. Leblanc Aug. 1974 28 p Transl. into ENGLISH from an AGARD report
(Contract NASw-2481)
(NASA-TT-F-15853) Avail: NTIS HC $4.50 CSCL 01C

Distance predicting methods for aircraft braking performance is discussed for the case when braking is not limited by the brakes, but by the characteristics of tire-runway contact. Recently developed fighter and large capacity transport aircraft require that stopping distances and runway lengths be accurately correlated for different touchdown velocities, wind, and runway conditions. Author

N74-32420# Advisory Group for Aerospace Research and Development, Paris (France).
PRELIMINARY AIRCRAFT DESIGN
Clem C. Weissman Jun. 1974 189 p refs Partly in ENGLISH and partly in FRENCH Lecture series presented at Brunswick, West Germany, 6-7 May 1974, Breda, Netherlands, 9-10 May 1974, and Cranfield, England, 13-14 May 1974
(AGARD-LS-65) Avail: NTIS HC $12.50

An analysis of preliminary aircraft design procedures was conducted to show the response to a proposed military requirement with the first estimate of a complete aircraft configuration. The decision rationale and the initial estimation of size, weights, lift and drag, performance, and cost is presented with respect to the payload for various aircraft types and classes and the proposed mission. Emphasis is placed on how this small preliminary design team must make the first decisions regarding technical feasibility and operational desirability. An experienced design team can predict with sufficient accuracy the overall weight, configuration, performance, and cost to permit confident decision to proceed with advanced development of the project. For individual titles, see N74-32421 through N74-32426.

N74-32421 Advisory Group for Aerospace Research and Development, Paris (France).
INTRODUCTION TO PRELIMINARY AIRCRAFT DESIGN
Clem C. Weissman *In its* Prelim. Aircraft Design Jun. 1974 2 p (For availability see N74-32420 22-02)

The satisfaction of military aircraft requirements as it affects the size and performance of aircraft is discussed. The basic boundaries for the new aircraft design are defined as: (1) the operational concept for the dominating mission and physical boundaries, (2) the aircraft performance desired with respect to aircraft speed, range, altitude ceiling, acceleration, and payloads,

and (3) physical constraints as determined by ground support facilities. The procedures to be followed in arriving at a three view drawing and a weight and balance statement are briefly explained. Some of the compromises which must be met in aircraft design are explained. Author

N74-32422 Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France).
PRELIMINARY DESIGN OF CIVIL AND MILITARY AIRCRAFT AT AVIONS MARCEL DASSAULT-BREGUET AVIATION
J. Czinczenheim *In* AGARD Prelim. Aircraft Design Jun. 1974 66 p refs In FRENCH and ENGLISH (For availability see N74-32420 22-02)

The procedures followed by a French aircraft manufacturing company in the design and production of military and civilian aircraft are discussed. The subjects considered include the following: (1) the organization of the preliminary project staff, (2) the responsibilities of the project engineer or program manager, and (3) iterative steps to be followed in arriving at the preliminary aircraft configuration. The design procedures which followed in the development of specific military and civilian aircraft are analyzed. The steps which are taken to predict the performance of the preliminary design configuration are explained. The evaluation of lift and drag characteristics at the preliminary design stage is emphasized. The functions of a weapon system department with respect to the preliminary project phase, the detailed definition phase, integration tests, and the integration of production equipment are outlined. Author

N74-32423 British Aircraft Corp., Preston (England).
PROPULSION/AIRCRAFT DESIGN MATCHING EXPERIENCE
Raymond F. Creasey *In* AGARD Prelim. Aircraft Design Jun. 1974 72 p (For availability see N74-32420 22-02)

The procedures for matching propulsion systems and airframes to obtain specific performance standards are described. The actual experiences of aircraft development for a reconnaissance aircraft, a fighter aircraft, a supersonic transport, and a subsonic transport are reported. Data are presented in the form of graphs to show aircraft performance in terms of speed versus altitude, fuel consumption versus range, and thrust and drag characteristics. The various formulas and mathematical models which are used to obtain the desired match of power plant and airframe for various mission requirements are included. The application of computer techniques for the optimization of aerodynamic configurations is discussed. Author

N74-32424 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
DESIGNING FOR MANEUVERABILITY: REQUIREMENTS AND LIMITATIONS
Helmut Langfelder *In* AGARD Prelim. Aircraft Design Jun. 1974 18 p (For availability see N74-32420 22-02)

Based in the technology expected to be operationally available in the 1970 time period, the design requirements and relevant design trades to ensure adequate maneuverability of military aircraft are discussed. The basic contradiction of range versus payload and maneuverability requirements are treated from the point of view of preliminary design. Maximum lift and buffet penetration as well as maneuver devices are presented. Reference is made to cost implications. A point design for extreme maneuverability is analyzed with respect to the characteristics of balanced design for fighter aircraft. Author

N74-32425 LTV Aerospace Corp., Dallas, Tex.
MODERN ENGINEERING METHODS IN AIRCRAFT PRELIMINARY DESIGN
W. W. Huff, Jr. *In* AGARD Prelim. Aircraft Design Jun. 1974 16 p refs (For availability see N74-32420 22-02)

The impact of computer technology on modern engineering methods for the preliminary design of aircraft is discussed. Large capacity digital computer systems and their peripheral equipments provide the opportunity to bring all significant technical and managerial disciplines together in an integrated program. Most design synthesis computer programs are constructed in a modular fashion, which are controlled by the technical disciplines responsible for the state-of-the-art in each particular area. In general, these disciplines will apply the input data at a level of detail consistent with the phase of the preliminary design process. The phases of preliminary design which are considered are: (1) program definition, (2) concept formulation, and (3) contract definition. Author

N74-32426 General Dynamics/Fort Worth, Tex. Convair Aerospace Div.
THE TEAM LEADER'S ROLE IN DESIGN TO COST PRELIMINARY DESIGN
Lyman C. Josephs, III *In* AGARD Prelim. Aircraft Design Jun. 1974 9 p (For availability see N74-32420 22-02)

The organization and functions of a typical Air Force weapon systems office involved in aircraft development are discussed. Emphasis is placed on the YF-16 aircraft program. The management approach of the office is described. The contract requirements to accomplish the objectives for the prototype program are defined. Charts are developed to show the schedule for the YF-16 prototype program and the total budget cost versus actual expenditures are shown. The configuration changes which occurred since approval of the contract are discussed to show the effects on expenses and weapon system development. Author

N74-32427*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPERIMENTAL INVESTIGATION OF THE LANDING DYNAMICS OF THREE-LEGGED SPACECRAFT MODELS
Sandy M. Stubbs Washington Sep. 1974 80 p Film supplement number L-1151 to this report is available from NASA Langley Research Center, Hampton, Va. 23665
(NASA-TN-D-7664; L-9499) Avail: NTIS HC $4.00 CSCL 01B

An experimental investigation was conducted to obtain accurate data from two three-legged spacecraft landing systems for purposes of validating current and future computer programs for legged landers. Two landing-gear systems were investigated: an inverted tripod system and a cantilever system. Tests were conducted for eight landing conditions chosen to obtain stability data, maximum loads, and maximum strokes for correlation with analytical results. Data from the two models are not directly comparable because of geometry and mass differences, but both are considered to be typical models of the respective landing-gear systems. Results indicate that maximum accelerations for both models, which occurred during a nearly flat landing on a horizontal surface, were nearly the same (approximately minus 18g). Maximum primary strut forces occurred for landings into a 20 deg slope and were 40 kiloNewtons (9000 lbf) and 47 kiloNewtons (10 500 lbf) for the inverted tripod and cantilever models, respectively; and maximum primary strut strokes for both models were 19 cm (7.4 in.). The inverted tripod model was slightly more stable than the cantilever model because of a larger ratio of footpad radius to center-of-gravity height. Author

N74-32428*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
APPARATUS FOR SPAN LOADING TO ALLEVIATE WAKE-VORTEX HAZARD BEHIND AIRCRAFT Patent Application
Vernon J. Rossow, inventor (to NASA) Filed 17 Sep. 1974 29 p
(NASA-Case-ARC-10801-1; US-Patent-Appl-SN-506802) Avail: NTIS HC $4.50 CSCL 01C

The aerodynamic configuration of a swept back aircraft wing for alleviating the wake-vortex hazard behind the aircraft is discussed. The airflow behind the wing is altered by deployment of segmented flaps to produce tailored span loading. Sawtooth span loading is used to generate a translating sheet of air flow energy which develops several unequal vortex pairs which break up the turbulent wake. Diagrams of the wing planforms and the resulting wake distribution are provided.
NASA

N74-32429# Boeing Co., Seattle, Wash.
THE 727 NOISE RETROFIT FEASIBILITY. VOLUME 3: UPPER GOAL FLIGHT TESTING AND PROGRAM SUMMARY Final Report, Jul. 1971 - Dec. 1972
D. L. Hiatt and M. B. McKaig Jun. 1973 224 p refs
(Contract DOT-FA71WA-2637; FAA Proj. 45334)

(AD-768850; D6-60196-Vol-3; FAA-RD-72-40-Vol-3) Avail: NTIS HC $5.75

Flight tests were conducted on the Boeing 727 aircraft with modified nacelles for reduction of aerodynamic noise. The nacelles consisted of peripheral acoustic lining in all inlets plus double-ring acoustic treatment in the side engine inlets, acoustically treated engine fan ducts, and multilobe variable geometry jet noise suppressors discharging through fixed, acoustically lined ejectors, with provision for automatic closure of the ejector inlets for cruise operation. Acoustic, propulsion, and aerodynamic performance analyses were made, along with a direct operating cost analysis. Author

N74-32430# Boeing Co., Wichita, Kans.
FAA JT3D QUIET NACELLE RETROFIT FEASIBILITY PROGRAM. VOLUME I-1: LOWER GOAL DESIGN, FABRICATION AND GROUND TESTING Final Report, Jul. 1971 - Feb. 1973
J. E. Mayer et al Jun. 1973 152 p refs
(Contract DOT-FA71WA-2628)
(AD-775453; FAA-RD-73-131-Vol-I-1; D3-9042-1) Avail: NTIS HC $10.75

The design, fabrication, and ground testing of a flightworthy quiet nacelle which satisfied the FAA lower goal for noise reduction of JT3D powered 707 aircraft was conducted. The quiet nacelle configuration consisted of a two-ring acoustically treated inlet, new fan thrust reverser, 3/4 length acoustically treated fan ducts, and revised contour aft translating sleeve. The configuration retained the standard primary thrust reverser and engine tailpipe. The quiet nacelle was ground tested to determine acoustic and performance data. Production JT3D nacelles were similarly tested thus providing a baseline whereby comparisons of acoustic and propulsion performance could be made. Projections of the demonstrated noise reductions to flight conditions indicate that the Phase 1 nacelle will satisfy the maximum noise levels allowed for JT3D powered 707 aircraft. Demonstrated static propulsion performance of the quiet nacelle indicates that no loss in takeoff performance should be expected from these aircraft. Author

N74-32431# Civil Aeromedical Inst., Oklahoma City, Okla.
A COMPARISON OF THE STARTLE EFFECTS RESULTING FROM EXPOSURE TO TWO LEVELS OF SIMULATED SONIC BOOMS
Richard I. Thackray, Robert M. Touchstone, and Joe P. Bailey Dec. 1973 11 p refs
(AD-777581; FAA-AM-73-16) Avail: NTIS HC $4.00

Subjects were exposed indoors to simulated sonic booms having outside overpressures of 50 and 150 N/sq m. Rise times were held constant at 5.5 msecs. In addition to the outside measurements, inside measures of dblin and dbA were also obtained. Subjects attempted to hold a hand steadiness device on target during boom exposure and amplitude of the arm hand startle response was determined. Recordings were also obtained of the skin conductance and heart rate responses as well as the eye blink reflex. Although the 50 N/sq m boom produced slight arm hand startle responses in a small percentage of subjects, the frequency of these responses was significantly greater to the higher boom level. The results are compared with the findings of other studies, and the tentative conclusions advanced that sonic booms experienced indoors may cause slight arm hand startle responses which could have adverse effects on occupational tasks. Author

N74-32432*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A STUDY OF SUBSONIC TRANSPORT AIRCRAFT CONFIGURATIONS USING HYDROGEN (H2) AND METHANE (CH4) AS FUEL
Daniel B. Snow, Blake D. Avery, Lawrence A. Bodin, Paul Baldasare, and G. Fredrick Washburn 1 Aug. 1974 32 p
(NASA-TM-X-71994) Avail: NTIS HC $3.25 CSCL 01C

The acceptability of alternate fuels for future commercial transport aircraft are discussed. Using both liquid hydrogen and methane, several aircraft configurations are developed and energy consumption, aircraft weights, range and payload are determined and compared to a conventional Boeing 747-100 aircraft. The results show that liquid hydrogen can be used to reduce aircraft energy consumption and that methane offers no advantage over JP or hydrogen fuel. Author

N74-32433# Federal Aviation Administration, Washington, D.C.
THE RESPONSE OF SONGBIRDS TO THE SEISMIC COMPRESSION WAVES PRECEDING SONIC BOOMS Final Report
Thomas H. Higgins May 1974 27 p refs
(AD-780050; FAA-RD-74-78) Avail: NTIS HC $4.50

During 1973 and 1974, the Federal Aviation Administration (FAA) had the opportunity to study the effects of sonic booms on the environment during routine U. S. Air Force F-111 supersonic acceptance test flights southwest of Fort Worth, Texas. A coordinated program permitted simultaneous observations of sonic boom environmental effects and measurements of sonic boom ground overpressure signatures, F-111 operating conditions and atmospheric conditions to be made simultaneously. Among the environmental and operational problems studied during this program were the effects of the sonic booms on wildflife. In addition to the customary sonic boom overpressure signature measurements, audio tape recordings were made at both outdoor and indoor measurement sites and these were studied in relation to the other measures obtained. Analysis of the audio tapes disclosed an interesting phenomenon. The continuous songs of birds of the field were completely silenced 4 to 8 seconds prior to the arrival of the audible sonic boom. Additional audio recordings, made for the specific purpose of verifying this complete silence of all songbirds 4 to 8 seconds prior to the arrival of the sonic boom's audible report and overpressure signature measurement, were identical to the first obtained. Author

N74-32434# Boeing Co., Wichita, Kans.
FAA JJ3D QUIET NACELLE RETROFIT FEASIBILITY PROGRAM. VOLUME 1-2: LOWER GOAL SYSTEM AND COMPATIBILITY TESTS Final Report, Aug. 1972 - Jul. 1973
J. E. Mayer et al Sep. 1973 134 p refs
(Contract DOT-FA71WA-2628; FAA Proj. 202-811-058)
(AD-781826; D3-9042-2; FAA-RD-73-131-Vol-1-2) Avail: NTIS HC $3.75

The Phase 1 quiet nacelle for JT3D powered 707 aircraft includes a two-ring acoustically treated inlet, hydraulically powered fan thrust reverser, 3/4 length acoustically treated fan ducts, and revised contour aft translating sleeve. The nacelle retains the standard 707 primary thrust reverser and engine tailpipe. Full scale and model testing of the Phase 1 nacelle were accomplished to determine engine/nacelle performance and the adequacy of new or extensively revised systems. Acoustic tests were performed to determine the efficacy of the acoustic system after extended engine operation. Tests were performed by Pratt and Whitney Aircraft to confirm the compatibility of the Phase 1 quiet nacelle and the JT3D-3B engine. Author

N74-32435# Federal Aviation Administration, Atlantic City, N.J.
A SUMMARY OF HELICOPTER VORTICITY AND WAKE TURBULENCE PUBLICATIONS WITH AN ANNOTATED BIBLIOGRAPHY Final Report, Jan. 1965 - Nov. 1973
Jack J. Shrager May 1974 189 p refs
(FAA Proj. 214-531-090)
(AD-780053; FAA-RD-74-48; FAA-NA-73-68) Avail: NTIS HC $4.00

A review of all literature published since 1964 relating to helicopter vortex systems and wake turbulence was made. The results of this review are evaluated and summarized, and conclusions are drawn relative to that review. The documents are grouped in general categories, and this is further supplemented by an annotated bibliography and authors index. Also incorporated in the review is a comparative analysis of rotary-wing versus fixed-wing circulation intensity time-history. Author

N74-32436# National Aviation Facilities Experimental Center, Atlantic City, N.J.
SMOKE EMISSION FROM BURNING CABIN MATERIALS AND THE EFFECT ON VISIBILITY IN WIDE BODIED JET TRANSPORTS Final Report, 1972 - 1974
Edward L. Lopez Mar. 1974 129 p refs
(Contract DOT-FA72NA-665)
(AD-776963; FAA-RD-73-127; FAA-NA-73-155) Avail: NTIS

HC $4.75

A study was made of the smoke emission of cabin materials in ten major categories of aircraft interior construction under various burning conditions. Two materials in each category tested represented high to low smoke emission values. A wide-bodied cabin mockup, 2774 cubic feet in volume was used to establish correlation with the 18 cubic foot NBS-type smoke chamber. Additionally, selected materials were tested in the wide-bodied mockup to relate human visual acuity to optical density with and without ventilation flow through the mockup. Results of the study indicate that fair to good correlation exists between the NBS-type smoke chamber and a cabin mockup for various sizes of materials tested in the mockup. Results of visibility studies indicate the relationship of optical density to human visual acuity with and without irritating gases and with and without ventilation flow rate through a wide-bodied cabin mockup. Author

N74-32437# Douglas Aircraft Co., Inc., Long Beach, Calif.
DC-9 NOISE RETROFIT FEASIBILITY. VOLUME 1: LOWER GOAL NOISE, PERFORMANCE AND COST EVALUATION Final Report, Jan. 1972 - May 1973
W. R. Dunbar Nov. 1973 178 p refs
(Contract DOT-FA72WA-3116)
(AD-776127; FAR-RD-73-124-Vol-1; MDC-J4355-Vol-1) Avail: NTIS HC $5.50

A flight test program was completed, including noise, performance and flightworthiness tests on the baseline and modified versions of a DC-9-10 test airplane. A Cost study was conducted. Retrofit and production line installation costs and the effects on direct operating costs were estimated. The effects of the modification on block speed, fuel burned, payload range, takeoff field length and initial cruise altitude were determined. Exhaust system development tests were conducted on an engine static test stand to evaluate the lower goal exhaust system. Prototype components of the lower goal (DACO-2) nacelle were designed and fabricated. The prototype components were tested for effect on engine performance and noise, and for effect on the compatibility with the JT8D engine. A 100-hour durability test was performed, cycling the prototype nacelle through an accelerated simulated duty mission. A complete loads and stress analysis of the nacelle/airframe structure was performed. Author

N74-32438*# Boeing Commercial Airplane Co., Seattle, Wash.
STATIC PERFORMANCE AND NOISE TESTS ON A THRUST REVERSER FOR AN AUGMENTOR WING AIRCRAFT
D. L. Harkonen, C. C. Marrs, and J. V. OKeefe Jul. 1974 86 p refs
(Contract NAS2-7641)
(NASA-CR-137561; D6-41926) Avail: NTIS HC $7.50 CSCL 01C

A 1/3 scale model static test program was conducted to measure the noise levels and reverse thrust performance characteristics of wing-mounted thrust reverser that could be used on an advanced augmentor wing airplane. The configuration tested represents only the most fundamental designs where installation and packaging restraints are not considered. The thrust reverser performance is presented in terms of horizontal, vertical, and resultant effectiveness ratios and the reverser noise is compared on the basis of peak perceived noise level (PNL) and one-third octave band data (OASPL). From an analysis of the model force and acoustic data, an assessment is made on the stopping distance versus noise for a 90,900 kg (200,000 lb) airplane using this type of thrust reverser. Author

N74-32439*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE LATERAL/DIRECTIONAL STABILITY CHARACTERISTICS OF A FOUR-PROPELLER TILT-WING V/STOL MODEL IN LOW-SPEED STEEP DESCENT M.S. Thesis - Princeton Univ., N.J.
Daniel J. DiCarlo Jun. 1971 114 p refs
(NASA-TM-X-70242) Avail: NTIS HC $8.75 CSCL 01C

Lateral-directional dynamic stability derivatives are presented for a 0.1-scale model of the XC-142A tilt-wing transport. The tests involved various descending flight conditions achieved at constant speed and wing incidence by varying the vehicle angle of attack. The propeller blade angle and the speed were also changed in the steepest descent case. The experimental data were analyzed assuming that the dynamic motions of the vehicle may be described by linearized equations, with the lateral-directional characteristics of the full-scale aircraft also presented and discussed. Results from this experimental investigation indicated that the full-scale aircraft would have a stable lateral-directional motion in level flight, with the dynamic motion becoming less stable as the descent angle was increased. Author

N74-32440*# Techtran Corp., Glen Burnie, Md.
A NEW TYPE OF SAIL PLANE
R. Platz Washington NASA Sep. 1974 7 p Transl. into ENGLISH of "Zeitschrift fuer u. Motorluftschiffahrt" W. Ger., v. 15, nos. 1 and 2, 26 Jan. 1974 p 1-2
(Contract NASw-2485)
(NASA-TT-F-15920) Avail: NTIS HC $4.00 CSCL 01C

Some early attempts to construct sail planes are reported. The authors are examining some new designs and new concepts for the flight control of such craft. They note that the prospects for the construction of a light weight, durable, easily disassembled plane of this type are good. Author

N74-32441*# Kanner (Leo) Associates, Redwood City, Calif.
ON THE APPLICATION OF THEORY OF MARKOV PROCESSES TO THE EVALUATION OF STATE OF DYNAMIC SYSTEMS AND TO CONTROL OF AIRCRAFT OSCILLATIONS
V. T. Tarushkin and V. S. Novoselov, ed. Washington NASA Aug. 1974 26 p refs Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 150-164
(Contract NASw-2481)
(NASA-TT-F-15817) Avail: NTIS HC $4.50 CSCL 12A

The application of Markov processes and stochastic differential equations to the evaluation of state of linear dynamic systems and to control of small oscillations of an aircraft in circular orbit is discussed. Author

N74-32442*# Kanner (Leo) Associates, Redwood City, Calif.
EFFECT OF ARTIFICIAL STABILITY ON AIRCRAFT PERFORMANCE
D. Reich Washington NASA Sep. 1974 16 p ref Transl. into ENGLISH of "Einfluss der Kuenstlichen Stabilitaet auf die Flugleistungen", Rept. DLR-MITT-72-05 Deutsche Gesellschaft fuer Luft- und Raumfahrt, Cologne, W. Ger., Mar. 1972 p 171-186
(Contract NASw-2481)
(NASA-TT-F-15953; DLR-Mitt-72-05) Avail: NTIS HC $4.00 CSCL 01C

Based on the control configured vehicle (CCV) concept, taking account of flight control during the design phase, the effect of an artificial longitudinal stability on the performance of aircraft was investigated. In consequent application of the CCV concept, in the most favorable cases a decrease of about 15% in takeoff weight (for the same radius of action) or an increase of 11% in radius of action (for the same takeoff weight) can be achieved. For a fighter aircraft, it is shown that the advantages of artificial longitudinal stability are obtained for high lift coefficients and for plane wing-body drag polars. Author

N74-32443*# Virginia Univ., Charlottesville. Dept. of Engineering Science and Systems.
EFFECTS OF AIRCRAFT DESIGN ON STOL RIDE QUALITY: A SIMULATOR STUDY Annual Report, 1 Jul. 1973 - 30 Jun. 1974
Ira D. Jacobson and Craig R. Jones Jul. 1974 23 p refs
(Grant NGR-47-005-208)
(NASA-CR-140059; ESS-4035-102-74; Memo-403502) Avail: NTIS HC $4.25 CSCL 01C

To improve the ride quality in short takeoff aircraft, several means have been investigated. In general, these methods consist of placing sensors in the aircraft which sense aircraft motion, usually linear accelerations and angular rates. These signals are then used to deflect control surfaces which generate aerodynamic forces and moments which tend to minimize the motion which the passenger feels. One of the disadvantages of some of these systems is that they may tend to degrade the handling qualities

or controllability of the airplane, making it more difficult or annoying for the pilot to fly. Rather than using active control systems to control ride quality, one might possibly design aircraft so that they are inherently pleasant to ride. The purpose of this study is to determine the relationship between characteristic aircraft motions and aircraft ride quality. Author

N74-32444*# Virginia Univ., Charlottesville. Dept. of Engineering Science and Systems.
FLIGHT SIMULATOR EXPERIMENTS TO DETERMINE HUMAN REACTION TO AIRCRAFT MOTION ENVIRONMENTS Annual Report, 15 Jun. 1973 - 14 Jun. 1974
Ira D. Jacobson and Ashok N. Rudrapatna Jul. 1974 26 p refs
(Grant NGR-47-005-202)
(NASA-CR-140055; ESS-4039-102-74; Memo-403902) Avail: NTIS HC $4.50 CSCL 01C

An analysis of human response to aircraft motion is presented using data obtained on the NASA Flight Research Center's Jetstar aircraft. The purpose of these tests was to explore the relationship of vertical and transverse accelerations to human comfort as well as obtain information on the maximum comfortable bank angle for commercial aircraft operations. A preliminary study was also conducted to establish the importance or lack thereof of the low frequency content of aircraft motion due to natural turbulence. An effort has been made to model these data and comparisons with appropriate sources are made. Author

N74-32445# Institut Franco-Allemand de Recherches, St. Louis (France).
EXPERIMENTAL STUDY OF THE REFRACTION OF A BALLISTIC DETONATION WAVE IN A STRATIFIED ATMOSPHERE, PART 2 [ETUDE EXPERIMENTALE DE LA REFRACTION D'UNE DETONATION BALISTIQUE DANS UNE ATMOSPHERE ST RATIFIEE, 2EME PARTIE]
M. Schaffar, M. Pfister, and J. J. Brunner 25 Jun. 1973 42 p refs In FRENCH
(Contract DRME-73/191)
(ISL-18/73) Avail: NTIS HC $5.25

The refraction and focusing of a detonation wave, produced by a small caliber projectile, in a stratified atmosphere was investigated. The phenomenon was recorded using shadowgraph photography and pressure variation measurements. Focusing takes place at appr. 120 calibers away from the projectile with reinforcement of the wave intensity by a factor of 2.2 to 2.45. It was shown that the strong deceleration of the projectile has little influence on the focusing intensity. ESRO

N74-32446# Institut Franco-Allemand de Recherches, St. Louis (France).
EFFECTS OF METEOROLOGICAL CONDITIONS AND MEASUREMENT PRECISION ON THE EARTH TRACE OF THE SONIC BOOM WAKE (EXTINCTION, FOCALIZATION) [INFLUENCE DES CONDITIONS METEOROLOGIQUES ET DE LEUR PRECISION SUR LA POSITION AU SOL DU TAPIS DE BANG (EXTINCTION, FOCALLSATION SOUS TRACE)]
M. Schaffar and F. Schlosser 26 Jun. 1973 46 p refs In FRENCH
(Contract DRME-73/191)
(ISL-19/73) Avail: NTIS HC $5.50

The influence of meteorological conditions and the precision of the measurement of meteorological parameters on the prediction of the aircraft sonic boom path on the ground is discussed. It was found that the sonic boom of the second sounding of the two daily soundings at 6:00 and 12:00 a.m. was on average 5 km shorter. The importance of the precision of the meteorological data and of intensity calculations in the case of extraordinary long sonic booms was demonstrated. The effect of the longitudinal wind component on the focalization of the sonic boom along the flight path on the ground was shown, using a schematic case. ESRO

N74-32447# Lockheed-California Co., Burbank.
LABORATORY METHOD FOR EVALUATING EFFECT OF RUNWAY GROOVING ON AIRCRAFT TIRES Final Report, Dec. 1972 - Jan. 1974
G. Wittlin Mar. 1974 158 p refs
(Contract F33657-73-C-0311; AF Proj. 683M)
(AD-780614; LR-26151; ASD-TR-74-12) Avail: NTIS CSCL 01/3

The development of a laboratory technique which simulates an airplane operational touchdown on an existing representative grooved runway landing area is described. The laboratory technique demonstrates that chevron cutting of a 49 inch x 17 inch size tire (KC135, B727) landing on a dry 1/4 inch x 1/4 inch x 1 inch grooved concrete pavement slab is obtained which is representative of tire damage currently being experienced during airplane landings on grooved runways. A computer program is developed and used to analyze the method of approach and test results. Government and industry furnished tires, and eight different pavement configurations were tested. High speed motion pictures indicate that cutting occurs at the initial point of contact wherein speed is at a maximum. The test data is analyzed with regard to potentially critical parameters including energy absorption, forward velocity, and number of grooves traversed. (Modified author abstract) GRA

N74-32448# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
EQUATIONS DERIVED FOR COMPUTER PROGRAMMING OF HELIUM INFLATIONS FOR LARGE PLASTIC BALLOONS Instrumentation Papers
Bernard D. Gildenberg 22 Apr. 1974 17 p
(AF Proj. 6665)
(AD-780619; AFCRL-TR-74-0200; AFCRL-IP-218) Avail: NTIS CSCL 01/3

Helium inflation computations for large plastic research balloons are normally accomplished by a tedious mathematical procedure involving the use of tables which indicate available lift per tube at specified gas trailer pressures and temperatures. The tables evolved from MIT empirical data, and now have been approximated to within 0.1 lb of lift by a set of equations specifically developed for use in computer programs. The history of the tables, the advantages of converting from manual to computer processing of inflation computations, and resultant accuracies are covered in the report. Author (GRA)

N74-32449# General Research Corp., Santa Barbara, Calif. Science and Technology Div.
COST ANALYSIS OF AVIONICS EQUIPMENT, VOLUME 1 Final Report, 16 Apr. 1973 - 1 Mar. 1974
E. N. Dodson, S. F. Kornish, R. R. Lieberman, and W. E. Waller Feb. 1974 132 p refs
(Contract F33615-73-C-1205)
(AD-781132; GRC-CR-1-419-Vol-1; AFAL-TR-73-441-Vol-1) Avail: NTIS CSCL 01/3

The report addresses the problem of predicting the development, production, and logistic support cost of avionics equipment well before a detailed description of its physical makeup is known. The approach was to derive parametric cost estimating relationships (CERs) for four types of avionics subsystems: fire control radars, inertial navigators, digital computers, and Doppler navigation radars. These CERs are based on technical design variables familiar to the exploratory or advanced development design engineer. The development CERs incorporate an explicit measure of the development program's state-of-the-art advance. The logistic support CERs are functions primarily of equipment first unit cost or cumulative average cost. Author (GRA)

N74-32450# Hughes Aircraft Co., Culver City, Calif. Display Systems and Human Factors Dept.
HIGHLY RELIABLE VERTICAL DISPLAY SYSTEM Final Report, 10 Nov. 1972 - 10 Nov. 1973
H. L. Bjelland May 1974 153 p refs
(Contract N62269-73-C-0333)
(AD-780905; HAC-Ref-C6842; HAC-P73-482) Avail: NTIS CSCL 01/3

The purpose of the work is to investigate the critical mechanization parameters for a highly reliable Vertical Display System (VDS) with the overall goal of providing increased reliability. The three basic functional subunits are identified as the CRT indicator, the digital symbol generator, and the digital scan converter (DSC). Of the three major subunits comprising the VDS, the symbol generator offers the greatest potential for a very substantial gain in reliability. GRA

N74-32451# Northrop Corp., Hawthorne, Calif. Aircraft Div.
ADVANCED METALLIC STRUCTURES: AIR SUPERIORITY FIGHTER WING DESIGN FOR IMPROVED COST WEIGHT AND INTEGRITY. VOLUME 2: CRITERIA SENSITIVITY STUDY Final Report, Oct. 1972 - Mar. 1973
Fred A. Figge Jun. 1973 154 p refs
(Contract F33615-72-C-1891; AF Proj. 486U)
(AD-781811; NOR-73-82-Vol-2; AFFDL-TR-52-Vol-2) Avail: NTIS CSCL 01/3

Recent catastrophic airframe failures and near failures has led to a strong impetus to design new airframe primary structure to damage tolerant criteria requirements. Generally, this reflects a recognition that inadvertent or inherent flaws can be introduced in manufacturing of primary aircraft components that cannot be detected by existing NDI techniques. The current version of this criteria is the proposed revision to MIL-A-008866A, dated 18 August 1972, Revision D. This version of the damage tolerant criteria was considered a design requirement by Northrop in this Advanced Metallic Structures/Advanced Development Program. Information regarding the impact this criteria could have on a thin, high load factor, aircraft wing is very limited. Of particular concern are the effects deviations in nominal analysis variables can have on crack growth service life and damage tolerant design stress predictions. This damage tolerant criteria sensitivity study investigates these effects on an aircraft designed prior to the existence of these requirements. (Modified author abstract) GRA

N74-32452# Army Foreign Science and Technology Center, Charlottesville, Va.
PPK-U PARACHUTE DEVICE
V. Petrov 13 Aug. 1973 11 p Transl. into ENGLISH from Kryla Rodiny (USSR), no. 3, 1973 p 22-24
(AD-781220; FSTC-HT-23-1802-73) Avail: NTIS CSCL 01/3

The PPK-U is an integrated semiautomatic device designed to pull the ripcord on a parachute or other airborne rescue system. It can be set for altitudes of 0.3 to 8 km. and time delays of 0 to 5 sec. With a weight of 950 g., it is protected and sealed against environmental factors, and adaptable in six major variants for use with different types of equipment. Major parts include a clockwork timer, interlocking levers, an aneroid barometer, and a powerful spring-loaded ripcord mechanism with a 70 mm. pull. Author (GRA)

N74-32453# West Virginia Univ., Morgantown. College of Engineering.
NONLINEAR HELICOPTER ROTOR LIFTING SURFACE THEORY, PART 1
Thomas A. Csencsitz, Jerome B. Fanucci, and Hsi F. Chou Sep. 1973 208 p refs
(Contract N00014-68-A-0512; NR Proj. 215-163)
(AD-781885; TR-35-Pt-1) Avail: NTIS CSCL 01/3

A numerical method is developed based on potential flow nonlinear lifting surface theory for predicting the surface velocities and pressures on a rotor blade of an arbitrary helicopter rotor system which is executing a constant rotational and constant axial translational motion including, specifically, the hover flight mode. The formulation of the problem is exact in the sense that the normal surface boundary condition is satisfied on the surface of the rotor blade. The problem is governed by a Fredholm integral equation of the first kind which relates a singular velocity doublet potential surface distribution applied on the rotor blades and wakes to the normal relative velocity on the rotor blade surface. The wake model is assumed to be of a prescribed shape. (Modified author abstract) GRA

N74-32454# Naval Postgraduate School, Monterey, Calif.
THE IMPLEMENTATION OF A FIXED BASE HELICOPTER SIMULATION IN THE INVESTIGATION OF AN AUTOMATIC SCAN SYSTEM M.S. Thesis
Stephen Sanders Hoxie Mar. 1974 105 p refs
(AD-781404) Avail: NTIS CSCL 01/3

This report discusses the design and development of a six degree of freedom fixed base simulation of the SH2F helicopter using a hybrid computer interfacing with a computer graphics terminal. The purpose of the simulation was to investigate a scheme for alleviating a helicopter pilot's scan workload during transition to and from hover during instrument flying conditions. Author (GRA)

N74-32455# Army Foreign Science and Technology Center, Charlottesville, Va.
VORTEX FORMATION IN OBLIQUE FLOW AROUND A HELICOPTER ROTOR
A. V. Larin 3 May 1974 12 p refs Transl. into ENGLISH of Uch. Zap., Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 1, no. 3, 1970 p 115-122
(AD-781245; FSTC-HT-23-2365-72) Avail: NTIS CSCL 01/3

The work presents results of experimental determination of the structure and shape of the vortex wake behind a rotor in a slanted flow, containing a description of the earlier unknown secondary deflection of the system of end vortices, which is in turn a result of the primary deflection of the shroud of vortex lines at the rear edge of each blade. GRA

N74-32456# Boeing Commercial Airplane Co., Seattle, Wash.
ADVANCED METALLIC STRUCTURE: CARGO FUSELAGE DESIGN FOR IMPROVED COST, WEIGHT, AND INTEGRITY Final Report, 1 Jun. 1972 - 1 Apr. 1973
John E. McCarty Jun. 1973 461 p refs
(Contract F33615-72-C-1893; AF Proj. 486U)
(AD-781814) Avail: NTIS CSCL 01/3

The preliminary design study was conducted to identify, evaluate, and select advanced concepts for cargo aircraft fuselage structure. The goals were to reduce the structural weight, maintain the baseline fatigue life (60,000 flight-hours and 20,000 flights), and reduce the acquistion cost. All three selected fuselage shell concepts provide a reduction in both total unit (2% to 7%) and participating weight (17% to 19%). Three adhesive-bonded fuselage shell concepts are recommended for further study, development, and test evaluation. Adhesive-bonded construction was chosen as the primary assembly method to reduce structural weight because it allows a significant improvement in fatigue quality of the structure. The improved fatigue quality allowed effective utilization of the new aluminum alloys, which provide a combination of improved fracture toughness and strength. Fracture mechanics and fatigue life characteristics of new aluminum alloys were investigated in an exploratory testing program. Sensitivity studies were conducted to evaluate the impact of the application of the USAF Damage Tolerance Criteria. (Modified author abstract) GRA

N74-32457# Army Aviation Systems Command, St. Louis, Mo.
MAJOR ITEM SPECIAL STUDY (MISS), OH-6A MAIN ROTOR HUB Interim Report, 1 Jan. 1964 - 1 Jul. 1973
Jun. 1974 23 p
(AD-781507; USAAVSCOM-TR-74-29) Avail: NTIS CSCL 01/3

Major Item Special Study (MISS) reports are performed on DA Form 2410 reportable components. These are time change items and certain condition change items selected because of high cost or need for intensive management. Basically, the MISS reports are concerned with analyzing reported removal data presented in the Major Item Removal Frequency (MIRF) report. The failure modes reported for each removal are examined and grouped into categories which are intended to clarify the intent of the data reporting. From this data, removal distribution can be plotted and an MTR (mean time to removal) can be calculated. The MISS reports then investigate possible cost savings based on total elimination of selected failure modes. These modes are chosen because of the percentage of failures they represent and/or because they appear to be feasible Product Improvement Program (PIP) areas. Author (GRA)

N74-32458# Teledyne Ryan Aeronautical Co., San Diego, Calif.
RPV SHIPBOARD LAUNCH AND RECOVERY OPERATIONS STUDY Final Report
George C. Cota and Waldo V. Opfer, Jr. 28 Feb. 1974 266 p refs
(Contract N00014-73-C-0370; NR Proj. 212-221)
(AD-781712; TRA-29369-3) Avail: NTIS CSCL 01/2

Various methods for launch and recovery of remotely piloted vehicles (RPVs) from the decks of Naval ships were investigated. Eight RPV designs were developed to evaluate launch and recovery concepts from three classes of ships: the aircraft carrier, the

sea control ship, and the ocean escort. Two basic RPV missions were assumed for the study: A 500-nautical-mile, high-low-high altitude, high subsonic penetration mission; and a medium-high altitude 14-hour endurance surveillance mission. (Modified author abstract) GRA

N74-32459# Army Foreign Science and Technology Center, Charlottesville, Va.
A METHOD OF DETERMINING THE DANGER OF AIRPLANE ICING
I. G. Pchelko 16 Jul. 1974 5 p Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 3, 1947 p 63-64
(AD-781221; FSTC-HT-23-1818-73) Avail: NTIS CSCL 01/3

A collection of the results of climatological research for the marine weather service includes an abstract of a study done by the Finnish meteorologist Simila on determining the danger of icing in various air layers. Simila proposes a fairly simple method of determining the danger of icing. This method is based on humidity readings. GRA

N74-32460# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVESTIGATION OF BOUNDARY LAYER TRANSITION ON A WING PROFILE AT SUPERSONIC SPEEDS
V. I. Kornilov, V. Ya. Levchenko, and A. M. Kharitonov 18 Jun. 1974 16 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Sibirskoe Otd., Ser. Tekhn. Nauk (USSR), no. 3, 1971 p 15-20
(AD-781635; FTD-HT-23-1281-74) Avail: NTIS CSCL 01/3

The work is devoted to a study of the phenomenon of boundary layer transition on a parabolic wing profile. Particular attention is paid to an investigation of the effect of blunting of the wing's leading edge as well as the effect of a single Re number on the transition of a laminar boundary layer to a turbulent one. An attempt was made to explain the reason for the influence of the degree of blunting of the leading edge on the transition region. GRA

N74-32461# Naval Postgraduate School, Monterey, Calif.
DATA ACQUISITION SYSTEM FOR AIRCRAFT FLYING QUALITY INVESTIGATIONS M.S. Thesis
Robert Frederick Johnson Jun. 1974 102 p refs
(AD-781863) Avail: NTIS CSCL 01/3

Various methods of providing a data acquisition system for the Department of Aeronautics Cessna 310 H model aircraft were considered. The system was to be reliable, functional and reasonably simple to operate in conjunction with its use in the flying laboratory. A need for dynamic flight information was recognized as an integral component in evaluating flying qualities. A three-axis rate gyro system was designed to meet this requirement. Output requirements included data accuracy, data availability and an associated simplicity in data reduction. (Modified author abstract) GRA

N74-32462# Colorado Univ., Boulder.
RADAR SIGNATURE STUDIES APPLICABLE TO BIRD-AIRCRAFT COLLISION AVOIDANCE Final Report, 18 Jun. 1970 - 15 Nov. 1973
Warren L. Flock Jun. 1974 65 p refs
(Contract F29601-70-C-0076; AF Proj. 683L)
(AD-781787; AFWL-TR-73-149) Avail: NTIS CSCL 01/2

As a continuation of previous studies of the bird-aircraft collision hazard, the modulation of radar echo amplitude due to the wingbeat of birds was investigated. For this purpose, a GEC-AEI No. 654 radar, a Princeton Model CW-1 Boxcar Integrator, a Brush 220 paper-chart recorder, a cassette magnetic-tape recorder, and digital processing equipment have been utilized. Amplitude variations recorded on paper chart often allow quick and unambiguous estimates of bird size and type. The data indicate that it is possible to make such determinations when numbers of birds of different types are contributing to the radar echoes. The data were obtained by using a fixed radar beam and letting birds fly through the beam. Recorded wingbeat frequencies range from 2.5 Hz as a lower limit to about 30 Hz. The higher frequencies generally are due to insects rather than birds. In addition to reporting the data obtained, the capabilities of various radars, including coherent and incoherent pulse Doppler and CW radars, are considered. (Modified author abstract) GRA

N74-32463# Fiber Science, Inc., Gardena, Calif.
LOW-RADAR CROSS-SECTION OH6-A HELICOPTER TAIL ROTOR BLADE Final Report, Mar. - Dec. 1973
Sam Yao and Dale Abildskov Apr. 1974 71 p
(Contract DAAJ02-73-C-0041; DA Proj. 1F2-62205-AH-88)
(AD-781564; USAAMRDL-TR-74-31) Avail: NTIS CSCL 01/3

The design, fabrication, and testing results of a low-radar-cross-section (LRCS) filament-wound composite tail rotor blade for the OH-6A helicopter are reported. Two full-scale blades and four 12-inch-long blade sections were fabricated during the program. The blades and blade sections were all fabricated principally from Kevlar 49 roving/epoxy. The blades and blade sections all had sheets of microwave-absorbent materials laminated integrally with the windings to reduce the radar signature of the composite blade. (Modified author abstract) GRA

N74-32464# Naval Postgraduate School, Monterey, Calif.
SEQUENCE EFFECTS IN PREDICTING FATIGUE DAMAGE OF HIGH PERFORMANCE AIRCRAFT M.S. Thesis
John Edward Kane Jun. 1974 95 p refs
(AD-781858) Avail: NTIS CSCL 01/3

A flight loading profile based solely on accelerometer data is developed which accounts for all fatigue damaging loads experienced by high performance aircraft. A random sequence of the flight loads is generated in a computer program that applies the ESDU cumulative damage hypothesis for damage prediction of fleet aircraft. Data from actual accelerometer readings are used in evaluating whether reasonable results can be obtained from the program. The feasibility of implementing the program is discussed along with recommendations improving the suitability of the program for more accurate predictions. Author (GRA)

N74-32465# Naval Postgraduate School, Monterey, Calif.
CONSTRUCTION OF ONE-TENTH SCALE MODEL OF THE XFV-12A AND CANARD PERFORMANCE TEST M.S. Thesis
James Edward Killian Mar. 1974 60 p refs
(AD-781395) Avail: NTIS CSCL 01/3

The XFV-12A is a high performance, VTOL, fighter/attack aircraft which incorporates ejectors in the wings and canards for thrust augmentation. During transition from VTOL to normal flight, the interaction between downflow of the lifting jets and relative flow from forward flight generates vortices distinct from airfoil circulation. These vortices are associated with the bending of the lifting jets resulting in induced velocities at the aircraft; the magnitude and influence of the vortices are unknown. The object of this thesis was to prepare a suitable one-tenth scale semi-span model of the XFV-12A for a smoke tunnel flow visualization study to explore vortex development. (Modified author abstract) GRA

N74-32466# Naval Postgraduate School, Monterey, Calif.
EXPERIMENTAL INVESTIGATION OF HYDRAULIC RAM M.S. Thesis
Larry Scott Mueller Mar. 1974 44 p refs
(AD-781401) Avail: NTIS CSCL 01/3

Extensions of the investigations aimed at preventing aircraft destruction through the effects of hydraulic ram were conducted. By analyzing spark shadowgraphs the existence of a family of transient shock waves was confirmed. These shock waves were created by a surface anomaly in a projectile and are not unlike those found in fragmentary warheads. In an attempt to measure wall deflections subsequent to projectile impact, a system based on optical fiber proximity probes was investigated. Mathematical models based on grid distortions were used as a means of calculating shock wave pressures. The AFIT thesis correlating cavity size, energy and radius to underwater explosions was verified from an analysis of 16 mm films. Author (GRA)

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; Nuclear Engineering; and 28 Propulsion Systems.

N74-32467# Federal Aviation Administration, Washington, D.C. Systems Research and Development Service.
EXPERIMENTATION AND EVALUATION OF IMPROVED STALL WARNING EQUIPMENT, PHASE 2 Final Report
Barry C. Scott Nov. 1973 63 p refs
(FAA Proj. 560-101-02X)
(AD-773384; FAA-RD-73-179) Avail: NTIS HC $3.75

A flight test project was conducted at the Federal Aviation Administration's National Aviation Facilities Experimental Center at Atlantic City, New Jersey in 1971, to test and evaluate contemporary and improved general aviation aircraft stall warning systems. Five stall warning systems were tested during the program. The test vehicle was a 1964 Cessna 210D completely instrumented for flight test work with the Airborne Digital Data Acquisition. The experimentation is described, which was conducted to develop a more comprehensive flight test program for evaluation of stall warning systems. This program was used to evaluate five typical, and improved stall warning systems. Based on results of these tests, suggested revisions and additions to Federal Aviation Regulations Part 23, stall warning requirements, are discussed. Author

N74-32468# Institute of Gas Technology, Chicago, Ill.
FEASIBILITY STUDY OF ALTERNATIVE FUELS FOR AUTOMOTIVE TRANSPORTATION Interim Report
J. B. Pangborn and J. C. Gillis 16 May 1974 28 p refs Presented at the 7th Alternative Automotive Power Systems Coordination Meeting, Ann Arbor, Mich., 16 May 1974
(Contract EPA-68-01-211)
Avail: NTIS HC $4.50 CSCL 10A

Selection criteria were developed and applied to a number of alternative fuels. It is concluded that the most promising alternative fuels are synthetic gasoline and hydrocarbon distillates. Methanol is the next most attractive liquid fuel. Hydrogen is considered a speculative fuel which will become more attractive as fossil carbon resources are depleted. Author

N74-32469*# Kanner (Leo) Associates, Redwood City, Calif.
CONTRIBUTION TO THE CREATION OF BASIC DESIGN CONCEPTS FOR WIND POWER PLANTS Ph.D. Thesis
Ulrich Huetter Washington NASA Jul. 1974 97 p Transl. into ENGLISH of Ph. D. Thesis from Technische Hochschule, Vienna, May 1942 93 p
(Contract NASw-2481)
(NASA-TT-F-15822) Avail: NTIS HC $8.00 CSCL 10A

An estimate indicates that much more energy is available in the atmosphere than from the world's water-power resources. The most efficient dimensions of a power plant for tapping this energy are found to be a tower height of 35 meters and a rotor diameter of 40 meters, regardless of location. The concept of the rotor element, an annular part of the area covered by the rotor, is introduced for the derivation of relationships which are later applied to the entire rotor. Optimum blade planforms and section profiles are derived, and the best number of blades is found to be three. Author

N74-32470*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TERRESTRIAL APPLICATIONS OF FEP-ENCAPSULATED SOLAR CELL MODULES
A. F. Forestieri and A. F. Ratajczak 1974 23 p Presented at the Intern. Conf. on Photovoltaic Power Generation, Hamburg, 25-27 Sep. 1974
(NASA-TM-X-71608; E-8086) Avail: NTIS HC $3.00 CSCL 10A

FEP-encapsulated solar cell modules and arrays have been designed and built expressly for terrestrial applications. System design including solar cell array mechanical design and the approach to system sizing is outlined. Such solar cell systems have been installed at six sites. Individual modules have undergone marine environment tests. Results from seven months of operation indicate that system is meeting its electrical design requirements. No mechanical degradation has been reported. The array on Mammoth Mountain, California has been damaged by rime ice but shows no loss in electrical output. Marine environment tests on single modules have shown that elements of the module must be completely sealed by the FEP. Based on the limited test data available, the FEP-encapsulated solar cell module appears well suited to terrestrial applications. Author

N74-32471*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLAT PLATE COLLECTOR PERFORMANCE DETERMINED EXPERIMENTALLY WITH A SOLAR SIMULATOR
Richard W. Vernon and Frederick F. Simon 1974 21 p refs Presented at the Intern. Solar Energy Soc. Meeting, Fort Collins, Colo., 19-23 Aug. 1974
(NASA-TM-X-71602) Avail: NTIS HC $3.00 CSCL 10A

The NASA is constructing a new office building at Langley Research Center that will utilize solar energy for heating and cooling. A collector technology program being conducted at Lewis will provide the basis for selecting collectors for use at Langley. The technology program includes testing collectors in an indoor facility under simulated solar radiation. Tests have been conducted on five collectors to date and performance data are presented herein. Author

N74-32472# Oak Ridge National Lab., Tenn.
ENERGY CONSERVATION AND THE ENVIRONMENT Progress Report, 31 Dec. 1973
Mar. 1974 76 p refs
(Contract W-7405-eng-26; Grant NSF AF-398)
(ORNL-NSF-EP-66) Avail: NTIS HC $7.00

Emphasis was mainly placed on opportunities for energy conservation in the transportation and residential sectors. Preliminary results for a highly disaggregated model of the TVA service area were obtained for the electricity demand growth. The research on policy alternatives in coal mining is discussed. The chapter on energy conservation analysis contains sections on energy uses for automobiles, bicycles, and aircraft; total energy requirements of air transport; residential energy conservation; and energy use for food. From the discussion of demand for electricity, information is included on effect of rate structure; applicability of the national electric demand models to the TVA service area; data base and preliminary results in TVA area demand study; and communication and implementation of findings. Evaluation of alternative reclamation techniques, an overview on the role of coal, and implementation activities are included. NSA

N74-32473# Martin Marietta Labs., Baltimore, Md.
PROSPECTS OF PHOTOSYNTHETIC ENERGY PRODUCTION
B. Kok 1974 10 p Presented at 140th Meeting of the Am. Assoc. for the Advan. of Sci., San Francisco, 24 Feb. - 1 Mar. 1974
(Contracts AT(11-1)-3326; NSFC-705)
(COO-3326-27; Conf-740213-4) Avail: NTIS HC $4.00

The relevant aspects of photosynthesis are reviewed, the prospects for expanded exploitation of natural solar conversion systems are evaluated, and some avenues for needed research are suggested. The cheapest, largest, and most successful solar energy conversion system available is photosynthesis. Photosynthesis is not an efficient energy source. One approach examined was the search for increased yield of combustibles (e.g., woody plants) and another was the interference with photosynthetic processes so that combustible gases like hydrogen or methane were produced. NSA

N74-32474# Brookhaven National Lab., Upton, N.Y. Accelerator Dept.
SOLAR POWERED STEAM SUPPLEMENT FOR THE BNL STEAM PLANT
J. G. Cottingham and G. K. Green 15 Mar. 1974 26 p refs Sponsored by AEC
(BNL-18734) Avail: NTIS HC $4.50

Solar energy converted to commercial steam can be

distributed and used by existing equipment to heat and cool buildings. This forms a ready economical market for an otherwise expensive energy source. Component designs and system plans are outlined using an elevated boiler and reflectors that track the sun. Author (NSA)

N74-32475# Argonne National Lab., Ill.
DEVELOPMENT OF HIGH-SPECIFIC ENERGY BATTERIES FOR ELECTRIC VEHICLES Progress Report, Feb. - Jul. 1973
P. A. Nelson, E. C. Gay, R. K. Steunenberg, J. E. Battles, W. W. Schertz, D. R. Vissers, K. M. Myles, M. L. Kyle, D. S. Webster, and L. Burris Dec. 1973 47 p refs
(Contract W-7405-109-eng-38)
(ANL-8039) Avail: NTIS HS $5.45

A high specific energy lithium/sulfur battery having the performance characteristics required for powering pollution-free automobiles is described. The cells currently under development have negative electrodes of molten lithium and positive electrodes of sulfur separated by a molten lithium halide containing electrolyte. The operating temperature of the cells is about 400 C. Cells with positive electrodes consisting of sulfur arsenic carbon mixtures in graphite housings have achieved short time peak power densities and capacity densities that meet or exceed the goals for a single cell. A capacity density of 0.1 A-hr/sq cm has been sustained at a discharge current density of 0.1 A/sq cm for more than 500 hr and 100 cycles. Author (NSA)

N74-32476# Sandia Labs., Albuquerque, N.Mex. Criteria and Heat Transfer Div.
SOLAR COMMUNITY: ENERGY FOR RESIDENTIAL HEATING, COOLING, AND ELECTRIC POWER
W. H. McCulloch, D. O. Lee, and W. P. Schimmel, Jr. Feb. 1974 18 p refs Presented at 140th Meeting of the Am. Assoc. for the Advan. of Sci., San Francisco, 25-27 Feb. 1974
(Contract AT(29-1)-789)
(SLA-74-91; Conf-740213-3) Avail: NTIS HC $3.00

A series of systems studies on the potential uses of solar energy were conducted for the solar total energy community. This is a residential community which could significantly reduce its fossil fuel energy consumption by using the sun as the source for most of the community's energy needs. A system computer program was used to examine several candidate systems and to optimize the operation of interrelated components which provide space heating, air conditioning, water heating, and electricity for residences and light commercial buildings. An experimental program has been initiated to investigate various technological areas relative to the concept. The study shows that the solar community is technologically feasible and that the projected costs warrant the further investigation of solar energy as an alternative residential energy source. Author (NSA)

N74-32477# Sandia Labs., Albuquerque, N.Mex.
SOLAR TOTAL-ENERGY COMMUNITY PROJECT
G. E. Brandvold Mar. 1974 9 p
(Contract AT(29-1)-789)
(SLA-74-124) Avail: NTIS HC $4.00

The concept of a solar total energy community entails collecting solar energy at a central area, converting part of it to electricity, and distributing the rest of it to homes and/or businesses for space heating or cooling. A concept for such uses of solar energy, its departure from other solar-energy approaches, and the development program being conducted to further explore its feasibility are described. Author (NSA)

N74-32478# Sandia Labs., Albuquerque, N.Mex.
EXPERIMENTAL RESISTIVITY ELECTRODE EMPLACEMENT FOR THE HAWAII GEOTHERMAL PROJECT
G. E. Brandvold Apr. 1974 8 p refs
(Contract AT(29-1)-789)
(SLA-74-194) Avail: NTIS HC $4.00

Problems of geothermal resource research are considered. Field trials of an experimental terradynamics electrode for resistivity surveys have been carried out, and the design of an instrumented magma penetrometer was begun. Author (NSA)

N74-32479# Royal Aircraft Establishment, Farnborough (England).
CURRENT DEVELOPMENT STATUS OF VARIABLE SPEED CONSTANT FREQUENCY (VSCF) CYCLOCONVERTOR ELECTRICAL SUPPLY SYSTEMS FOR AIRCRAFT
T. D. Mason, ed. Dec. 1973 194 p refs Proc. of the Auxiliary Power Systems Working Group Meeting, Farnborough, Engl., 20 Sep. 1972
(RAE-TR-73101; BR38393) Avail: NTIS HC $12.75

Variable speed constant frequency (VSCF) cycloconverter electrical supply systems for aircraft are discussed. The following four topics are covered: electrical performance characteristics of VSCF systems, comparison of electrical generating systems based on IDG and VSCF techniques, performance and design characteristics of generators for VSCF use, and controls for cycloconverters. For individual titles, see N74-32480 through N74-32486.

N74-32480 Royal Aircraft Establishment, Farnborough (England). Engineering Physics Dept.
THE ADVANTAGES OF VARIABLE SPEED CONSTANT FREQUENCY GENERATOR SYSTEMS USING CYCLOCONVERTORS FOR GENERATING THREE-PHASE 400 Hz MAIN ELECTRICAL POWER IN AIRCRAFT
D. O. Burns *In its* Current Develop. Status of Variable Speed Constant Freq. (VSCF) Cycloconvertor Elec. Supply Systems for Aircraft, Dec. 1973 p 9-42 refs (For availability see N74-32479 22-03)

The operational advantages of the variable speed constant frequency generator systems using cycloconverters for generating three-phase 400 Hz main electrical power in aircraft were compared to the more conventional methods employing constant speed drive units to drive alternators at constant speed. Aspects analyzed were: frequency accuracy, transient voltage regulation, phase locking of separate power sources, and ability for dealing with motor loads. Three applications were investigated: to a flight control system using fly-by-wire, to inertial navigation equipment, and to start main propulsion engines. The most vital deciding issue was found to be the cost of ownership. The advantages over conventional CSD are: higher efficiency and, therefore, substantially less heat loss, synchronization of isolated power channels, and immunity to excessive maneuver accelerations. ESRO

N74-32481 Lucas Aerospace Ltd., Bradford (England).
INTERRUPT TIMES ON CONSTANT FREQUENCY ac SYSTEMS
C. J. Yarrow *In* RAE Current Develop. Status of Variable Speed Constant Freq. (VSCF) Cycloconvertor Elec. Supply Systems for Aircraft, Dec. 1973 p 43-57 (For availability see N74-32479 22-03)

The interrupt times to which constant frequency loads may be subjected are reviewed, and various CF systems for aircraft power supply are compared in respect to interrupt times. The cause of interrupts may be classified as follows: generation faults, bus-bar faults, downstream faults, and load switches. It was demonstrated that especially downstream fault interrupt times are very long and necessitate current limiting circuit breakers to prevent the occurrence of under voltages. ESRO

N74-32482 Ministry of Defence, London (England).
COMPARISON OF ELECTRICAL GENERATING SYSTEMS BASED ON IDG AND VSCF TECHNIQUES IN TWO TYPES OF AIRCRAFT
D. E. Marshall *In* RAE Current Develop. Status of Variable Speed Constant Freq. (VSCF) Cycloconvertor Elec. Supply Systems for Aircraft, Dec. 1973 p 59-73 (For availability see N74-32479 22-03)

Electrical generating systems of the IDG and VSCF technology were compared for an airbus type aircraft, and a small twin-engined military aircraft capable of operating at speeds up to Mach 2. The comparison was based mainly on mass. For the airbus, a VSCF supply does not have significant superior characteristics and it would therefore be expected that only a small equipment mass saving would be possible. For military aircraft it would appear that, on the basis of mass, the VSCF electrical generating system should be considered together with IDG for installation in small military aircraft of the future. ESRO

N74-32483 Hawker Siddeley Aviation, Ltd., Kingston upon Thames (England).

AIRCRAFT AUXILIARY POWER SYSTEMS STUDY. A MAIN GENERATION CHANNEL FOR A V/STOL STRIKE AIRCRAFT

E. F. Pincombe *In* RAE Current Develop. Status of Variable Speed Constant Freq. (VSCF) Cycloconvertor Elec. Supply Systems for Aircraft, Dec. 1973 p 75-93 refs (For availability see N74-32479 22-03)

The type of power generation system suitable for a V/STOL strike aircraft, notably the generation channel, was examined. Constant frequency ac, variable frequency ac, and low frequency dc supply were considered. The study of the type of power for main generation led to two possible arrangements: constant speed drive and constant frequency generator (from variable frequency generation and frequency conversion), which were discussed in detail. Performance, reliability, installation, weight, and costs of the two arrangements were compared. ESRO

N74-32484 Royal Aircraft Establishment, Farnborough (England). Engineering Physics Dept.

SOME COMMENTS OF THE ELECTRICAL PERFORMANCE OF GENERATORS OPERATING WITH RECTIFIED OUTPUT

P. A. Shaw *In its* Current Develop. Status of Variable Speed Constant Freq. (VSCF) Cycloconvertor Elec. Supply Systems for Aircraft, Dec. 1973 p 95-120 (For availability see N74-32479 22-03)

Development of variable speed constant frequency electrical systems for aircraft are discussed. Technical problems and their effect on machine design were examined. ESRO

N74-32485 Lucas Aerospace Ltd., Hemel Hempstead (England).

VSCF GENERATORS

E. Wharton *In* RAE Current Develop. Status of Variable Speed Constant Freq. (VSCF) Cycloconvertor Elec. Supply Systems for Aircraft, Dec. 1973 p 121-151 (For availability see N74-32479 22-03)

Design and construction aspects of variable speed constant frequency generators, notably solid rotor machines, are discussed. Results of performance tests are detailed. ESRO

N74-32486 Royal Aircraft Establishment, Farnborough (England). Engineering Physics Dept.

CONTROL ASPECTS OF AIRCRAFT TYPE CYCLOCONVERTORS

R. L. Piper and G. W. Wilcock *In its* Current Develop. Status of Variable Speed Constant Freq. (VSCF) Cycloconvertor Elec. Supply Systems for Aircraft, Dec. 1973 p 153-181 (For availability see N74-32479 22-03)

Control aspects of a cycloconverter for a variable speed constant frequency system are discussed. Topics dealt with include performance of generator control loop, cycloconverter power circuit, performance of cycloconverter without automatic control, reduction of the distortion in the cycloconverter output, regulation of the cycloconverter output, and system performance. ESRO

N74-32487# European Space Research Organization, Paris (France).

DIGITAL SERVOSYSTEM

Rudolf Dierke (DFVLR, Brunswick), Friedrich Erdmann, and Guenter Bunge May 1974 29 p refs Transl. into ENGLISH of Digitales Nachlaufsystem, DLR-Mitt-73-31, DFVLR, 27 Aug. 1973

(ESRO-TT-56; DLR-Mitt-73-31) Avail: NTIS HC $4.50; DFVLR, Porz, West Ger. 9,50 DM

A binary coded electrical signal is represented by a shaft position without recourse to high precision digital to analog conversion. After derivation of the equations describing the digital servo, taking particular account of the fully rotational system, a design using low cost TTL circuits is explained. The circuit permits the construction of servo systems with various types of servo drive. Demanded and actual positional values are processed digitally. The resulting positional difference may be applied to stepping motors, or via simple digital to analog converters, to dc motors. The electronic circuit can easily be extended for greater resolution, and with dc motor servos, the dynamic behavior can be adapted by altering the d/a conversion weighting. Author (ESRO)

N74-32488# Mitre Corp., McLean, Va.

SYSTEMS ANALYSIS OF SOLAR ENERGY PROGRAMS. APPENDIX: RESEARCH TASKS Final Report

Dec. 1973 150 p refs

(Grant NSF C-831)

(PB-231145/4; MTR-6513-App; NSF-RA/N-73-111) Avail: NTIS HC $4.75 CSCL 10A

A compendium is presented of proposed research tasks for each of the seven solar energy program sub-elements under the following five disciplines: (1) technical studies; (2) economic studies; (3) environmental studies; (4) sociological studies; and (5) institutional studies. Solar energy collection, conversion, storage, transmission and distribution, utilization, and systems integration subsystems are also matched with appropriate research tasks. Author (GRA)

N74-32489# Mitre Corp., McLean, Va.

SYSTEMS ANALYSIS OF SOLAR ENERGY PROGRAMS Final Report

Dec. 1973 325 p refs

(Grant NSF C-831)

(PB-231142/1; MTR-6513; NSF-RA/N-73-111A) Avail: NTIS HC $7.25 CSCL 10A

This is one of a series of reports that cover a study of the NSF Five-Year Solar Energy Research Program. The approach used included the following: define general program structure, identify and describe current state-of-the-art, assess currently studied systems, identify problems formulate comprehensive set of research tasks, identify proof-of-concept experiments, and describe scenarios for production and implementation. Each of seven major applications of solar energy have been analyzed in terms of their costs and the benefits that are expected accrue from their implementation. The heating and cooling of buildings, wind energy systems, and the utilization of organic materials appear to be best capable of achieving commercial application within a few years. Process-heat systems, solar-thermal systems, photovoltaic systems, and ocean thermal gradient systems, appear to need continued Federal Government support beyond the initial NSF 5-year Program for solar energy systems. (Modified author abstract) GRA

N74-32490# Mitre Corp., McLean, Va.

SOLAR ENERGY RESEARCH PROGRAM ALTERNATIVES. PROPOSED RESEARCH TASKS, COSTS AND SCHEDULES FOR THE NATIONAL SCIENCE FOUNDATION FIVE-YEAR SOLAR ENERGY RESEARCH PROGRAM Final Report

Dec. 1973 149 p

(Contract NSFC-831)

(PB-231141/3; MTR-6516; NSF-RA/N-73-111B) Avail: NTIS HC $4.75 CSCL 10A

Research Directorate Office of Systems Integration and Analysis. This document provides two alternative research plans, including task schedules and costs, for each of eight program elements: Heating and Cooling of Buildings, Process Heat, Thermal-Electric Energy Conversion, Photovoltaic Energy Conversion, Ocean Thermal Systems, Wind Energy Systems, Utilization of Organic Materials, and Common Applications. The two alternatives are (1) a set of research tasks considered to be the minimum necessary to bring about the widespred utilization of solar energy and (2) an accelerated plan to achieve more rapid utilization, with a higher degree of confidence and reduced technical risk. Author (GRA)

N74-32491# Mitre Corp., McLean, Va.

DISSEMINATION AND UTILIZATION OF SOLAR ENERGY RESEARCH RESULTS Final Report

Richard S. Greeley Dec. 1973 69 p refs

(Contract NSF C-831)

(PB-231144/7; MTR-6544; NSD-RA/N-73-111D) Avail: NTIS HC $3.75 CSCL 10A

Thirty recommendations have been made for establishing groups within or reporting to the NSF Solar Energy Program Office and initiating activities for the dissemination and utilization of solar energy research results. The primary recommendations include establishing an Advisory Commission and an information office reporting to the Program Director and constructing visitor centers on the sites of each Proof of Concept Experiment. Training courses and public education would be conducted at each center

following successful operation of the POCE system. (Modified author abstract) GRA

N74-32492# Illinois Univ., Urbana. Dept. of Civil Engineering.
RECLAMATION OF ENERGY FROM ORGANIC WASTE Final Report
John T. Pfeffer Mar. 1974 143 p refs
(Grant EPA-R-800766)
(PB-231176/9; EPA-670/2-74-016) Avail: NTIS HC $4.75 CSCL 13B

This study applied the anaerobic fermentation process to the production of methane from the organic fraction of urban refuse. Shredded domestic refuse from which the inorganic fraction was separated was used as a substrate. Raw sewage sludge was added to the substrate in proportion to the rate at which it is produced by a population producing a given quantity of refuse. The quantity and quality of gas produced, the rate of gas production, the solids reduction, nutritional requirements, and operating problems were evaluated in a laboratory system operating at temperatures ranging from 35C to 60C. The results of the laboratory study together with published data on both capital and operating costs of refuse shredding, refuse separation, reactor volume, reactor mixing, reactor heating, and residue dewatering were used to analyze the economics of the process. (Modified author abstract) GRA

N74-32493# American Univ., Washington, D.C.
RESEARCH ON ELECTROCHEMICAL ENERGY CONVERSION SYSTEMS Interim Technical Report, Apr. - Oct. 1973
Alayne A. Adams, Robert T. Foley, and Richard M. Goodman Feb. 1974 43 p refs
(Contract DAAK02-72-C-0084; DA Proj. 1T1-61102-A-34A)
(AD-780952; ITR-4) Avail: NTIS CSCL 07/4

The research on electrochemical energy conversion systems has involved a search for electrolytes alternative to phosphoric acid for direct and indirect hydrocarbon-air fuel cells. It has concentrated on trifluoromethanesulfonic acid monohydrate and perfluorobutyric acid. Experiments in which hydrogen was electrooxidized showed that the enhanced performance of the sulfonic acid is not restricted to propane. Further, it is indicated that adsorption intermediates of the type seen in phosphoric acid and detrimental to the efficiency of the process are absent in this electrolyte. The electro oxidation of propane in perfluorobutyric acid proceeds at a lower rate than in CF3SO3H.H2. An apparatus and technique to measure the solubility of gases in electrolytes was installed. Preliminary measurements of the solubility of propane in CF3SO3H.H2O are in the same range as those reported for H3PO4. (Modified author abstract) GRA

N74-32494# Standard Oil Co., Cleveland, Ohio. Research and Development Dept.
PRODUCTION AND ENGINEERING METHODS FOR CARB-TEK (TRADEMARK) BATTERIES IN FORK LIFT TRUCKS Interim Report, Jul. 1973 - Jan. 1974
Joseph E. Metcalfe Mar. 1974 28 p
(Contract DAAK02-73-C-0493)
(AD-780940) Avail: NTIS CSCL 10/3

The Carb-Tek battery employs a porous carbon cathode, a lithium-aluminum alloy anode, a eutectic mixture of potassium chloride and lithium chloride as the electrolyte, and a tellurium tetrachloride additive. This report describes the reconstruction of the Sohio battery pilot line. A great deal of time was spent in cleaning and inspecting equipment and replacing all piping associated with the inert atmosphere system, the molten salt handling system, and the water cooling systems. Pictures showing the present state of the facilities are presented. It is estimated that the battery pilot line is 75% complete. An abbreviated outline of the work to be completed during the second half of the contract is presented. (Modified author abstract) GRA

N74-32495# Power Conversion, Inc., Mount Vernon, N.Y.
PRIMARY ORGANIC ELECTROLYTE BATTERY BA-5-84( )/U Final Report, Jul. 1972 - Dec. 1973
Sandors Abens Mar. 1974 55 p
(Contract DAAB07-72-C-0287; DA Proj. 1G7-63702-DG-10)
(AD-780895; ECOM-0287-F-72) Avail: NTIS CSCL 10/3

Lithium-organic electrolyte batteries equal in size and output voltage to the BA-4386 magnesium battery were built and tested. Of the 307 batteries built on this program, 48 units were subjected to environmental and service life tests. With a cyclic load averaging to about 130 mA, service life was over 120 hours at room temperature. Reduction in service life was about 10% at 125F, 30% at -20F and 50% at -40F. About 95% of initial service life was retained after 30 days of stand at 160F. (Modified author abstract) GRA

N74-32496# Dayton Univ. Research Inst., Ohio.
A METHOD TO PREDICT THE SERVICE LIFE OF INTERNAL FUEL CELL BAFFLE MATERIALS
William E. Berner Jan. 1974 49 p refs
(Contract F33615-72-C-1282; AF Proj. 7381)
(AD-781260; UDRI-TR-73-65; AFML-TR-73-278) Avail: NTIS CSCL 10/2

The reversion of elastomeric materials under conditions of elevated temperature and humidity has been a serious problem for the Armed Services. This report describes techniques to predict the life of two elastomeric fuel cell baffle materials under these environmental conditions. The techniques involves taking empirical reversion data at 24 specific test conditions and using it to confirm that the reaction rate is first order and to determine the reaction rate constant used to predict the reversion time. In a second program, a fuel tank sealant was evaluated for use as a possible adhesive to bond the fuel cell baffle material to the fuel cell. Through the usage of the reaction rates developed in this report it can be shown that the life of foam materials may be predicted through temperature and humidity data. With the two materials discussed, the life of a polyester matting material was approximately 3.3 times longer than the life of a polyester polyurethane foam. The results of the second program shows that the life of the adhesive was longer than the expected life of the foam materials. (Modified author abstract) GRA

N74-32497# Army Foreign Science and Technology Center, Charlottesville, Va.
TRANSPORT AIR COOLERS WITH STANDARDIZED THERMOELECTRIC BATTERIES
Yu. D. Nikolaev and V. I. Peshel 3 May 1974 6 p Transl. into ENGLISH from Kholodiln. Tekhn. (Moscow), no. 5, May 1971 p 16-18
(AD-781012; FSTC-HT-23-2333-72) Avail: NTIS CSCL 13/1

The article discussed a standardized thermoelectric battery, which forms the basis of several local-action cooling units of automobiles, buses, agricultural and special machines. GRA

N74-33184 Stuttgart Univ. (West Germany). Inst. fuer Kernenergetik.
ELECTRON EMISSION POLYCRYSTALLINE SURFACE IN THE CESIUM CONVERTER [ELEKTRONENEMISSION POLYKRISTALLINER OBERFLAECHEN IM CAESIUMKONVERTER]
E. Maier and H. Otten *In* DFVLR Surface Phenomena in Thermionic Res. 16 Aug. 1973 p 37-50 refs In GERMAN (For availability see N74-33181 22-26)

N74-33185 Provence Univ., Marseille (France). Lab. de Photoelectricite.
WORK FUNCTION CHANGE OF POLYCRYSTALLINE TUNGSTEN WITH STRONTIUM ADSORPTION
J. P. David, J. L. Denisot, F. Floret, and G. Kassibrakis *In* DFVLR Surface Phenomena in Thermionic Res. 16 Aug. 1973 p 53-67 refs (For availability see N74-33181 22-26)

N74-33186 Commissariat a l'Energie Atomique, Saclay (France).
CO-ADSORPTION OF CESIUM, STRONTIUM AND OXYGEN ON (100) TUNGSTEN
J. L. Desplat and J. L. Denisot *In* DVLR Surface Phenomena in Thermionic Res. 16 Aug. 1973 p 69-81 refs (For availability see N74-33181 22-26)

N74-33187 Stuttgart Univ. (West Germany). Inst. fuer Physikalische Elektronik.
WORK FUNCTION MEASUREMENTS WITH AN IMPROVED FEM OF O2 AND Cs COVERED W- AND Mo-CATHODES
Rudolf Maly *In* DFVLR Surface Phenomena in Thermionic

Res. 16 Aug. 1973 p 83-102 refs (For availability see N74-33181 22-26)

N74-33189 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Energiewandlung und Elektrische Antriebe.
LOCAL THERMIONICS EMISSION FROM COVERED SURFACES OF ELECTRODES [LOKALE THERMISCHE ELEKTRONENEMISSIONEN UNTER DEM EINFLUSS VON SAUERSTOFF UND BARIUMDAMPF]
D. Schmidt *In its* Surface Phenomena in Thermionic Res. 16 Aug. 1973 p 117-128 In GERMAN; ENGLISH summary (For availability see N74-33181 22-26)

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N74-32498 Rouen Univ. (France). Lab. de Physiologie.
RESPIRATION REGULATION MECHANISMS AT REST AND DURING MUSCULAR EXERCISE FOR HIGH ALTITUDE ACCLIMATIZATION AND FOR HUMANS BORN AT HIGH ALTITUDES Final Report [ETUDE DES MECANISMES DE REGULATION DE LA RESPIRATION AU REPOS ET PENDANT L'EXERCICE MUSCULAIRE AU COURS DE L'ACCLIMATATION A HAUTE ALTITUDE ET CHEZ L'HOMME NE A HAUTE ALTITUDE]
R. Lefrancois Sep. 1973 32 p refs In FRENCH
(Contract DGRST-68-01-286)
Avail: Issuing Activity

Respiratory acclimatization for humans born at sea level consists of three phases. During the first days, there is metabolic compensation of the respiratory alkalosis due to hypoxic hyperventilation; during the next few weeks, polyglobulin appears; finally, after 15 to 20 years there is no difference in respiratory regulation between humans born at sea level and those born at high altitudes. The experiments reported are concerned with sea level born humans after acclimatization. A comparison with indigenous personnel reveals hyperventilation, both at rest and during muscular exercise, due to enhanced sensitivity to molecular oxygen and carbon dioxide stimuli. The performance remains inferior to the natives. ESRO

N74-32499 Centre National de la Recherche Scientifique, Strasbourg (France). Centre d'Etudes Bioclimatiques.
IMMEDIATE AND RETARDED EFFECTS OF SLEEP PERTURBATION DUE TO FOUR AIRCRAFT TYPES OF NOISE Final Report [EFFETS IMMEDIATS ET EFFETS CONSECUTIFS DE LA PERTURBATION DU SOMMEIL PAR QUATRE TYPES DE BRUITS D'AVION]
B. Metz and P. Schieber Sep. 1973 51 p refs In FRENCH; ENGLISH summary
(Contract DGRST-69-01-623)
Avail: Issuing Activity

Four types of aircraft noise differing in peak intensity and duration were used to induce sleep perturbations in 20 young adults of both sexes. Immediate effects were characterized by transitory activation periods (TAP), the intensity of which depends on the noise intensity and type of sleep (slow wave or paradoxical sleep). The Tap are precursors to sleep cycle modifications with more frequent sleep type changes, increase in number and duration of awake periods, increase in time-to-sleep. The perturbations were correlated with performance tests and simple task modification on the next morning. The importance of the observed effects and interindividual variations, both objective and subjective, may be correlated with some personality characteristics of the subjects. ESRO

N74-32500*# Kanner (Leo) Associates, Redwood City, Calif.
INHABITED SPACE, PART 2
B. P. Konstantinov, ed. and V. D. Pekelis, ed. Washington NASA Jul. 1974 192 p refs Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 215-369
(Contract NASw-2481)
(NASA-TT-F-820) Avail: NTIS HC $5.50 CSCL 06F

Aspects of the search for extraterrestrial life, the possibility of interstellar flights, and juridical factors of lunar exploration are considered. For individual titles, see N74-32501 through N74-32516.

N74-32501* Kanner (Leo) Associates, Redwood City, Calif.
SPACECRAFT- c31
K. P. Feoktistov *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 2-16 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 216-228 (For availability see N74-32500 22-04)
CSCL 22B

The task of building a spacecraft is compared to the construction of an artificial cybernetic system able to acquire and process information. Typical features for future spacecraft are outlined and the assignment of duties in spacecraft control between automatic devices and the crew is analyzed. G.G.

N74-32502* Kanner (Leo) Associates, Redwood City, Calif.
LIFE IN SPACE
N. M. Sisakyan *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 17-28 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 229-239 (For availability see N74-32500 22-04)
CSCL 06F

Biotechnological aspects of manned space flight are reviewed and the basic biological problems of training and sustaining man in interplanetary flights are elaborated. G.G.

N74-32503* Kanner (Leo) Associates, Redwood City, Calif.
SPACE PSYCHOLOGY
V. V. Parin, F. D. Gorbov, and F. P. Kosmolinskiy *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 29-41 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 240-249 (For availability see N74-32500 22-04)
CSCL 05J

Psychological selection of astronauts considers mental responses and adaptation to the following space flight stress factors: (1) confinement in a small space; (2) changes in three dimensional orientation; (3) effects of altered gravity and weightlessness; (4) decrease in afferent nerve pulses; (5) a sensation of novelty and danger; and (6) a sense of separation from earth. G.G.

N74-32504* Kanner (Leo) Associates, Redwood City, Calif.
DETECTION OF LIFE IN SPACE
W. Corliss *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820 Jul. 1974 p 42-52 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 250-257 (For availability see N74-32500 22-04)
CSCL 06F

The selection of spacecraft experiments and equipment to detect extraterrestrial life outside earth centers on observations of chemical compounds similar to amino acids and proteins, on signs of metabolism in the form of nutrient absorption, and life form impressions in fossiles or signs of civilization. G.G.

N74-32505* Kanner (Leo) Associates, Redwood City, Calif.
LUNAR MICROCOSMOS c06
N. Pirie *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 53-61 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 258-265 (For availability see N74-32500 22-04)
CSCL 06K

A human habitat on the lunar surface requires energy recycling metabolites based on the utilization of vegetative plants that are good photosynthesizers. Selection criteria involve reactions to fertilization by human excrements, suitability as food for man (with or without fractionation), physiological effects of prolonged ingestion of these plants, and technical methods for returning inedible portions back into the cycle. G.G.

N74-32506* Kanner (Leo) Associates, Redwood City, Calif.
PROBLEM OF SEARCHING FOR EXTRA-TERRESTRIAL CIVILIZATIONS c30

V. A. Ambartsumyan *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 62-66 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 266-269 (For availability see N74-32500 22-04)
CSCL 03B

Possible criteria characterizing extraterrestrial civilizations and their detection are: (1) deduction of their existence by evaluating astronimical prerequisites for the development of life in remote planetary systems; (2) detection and communication with extraterrestrial civilizations; and (3) the problem of language and content of information in transmitted signals. G.G.

N74-32507* Kanner (Leo) Associates, Redwood City, Calif.
MULTIPLICITY OF INHABITED WORLDS AND THE PROBLEM OF SETTING UP CONTACTS AMONG THEM **c30**
I. S. Shklovskiy *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 67-78 Transl. into ENGLISH from the Book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 270-279 (For availability see N74-32500 22-04)
CSCL 03B

The numerous planetary systems in our galaxy appear to a high degree of probability to contain some planets with a biosphere similar to earth' environment. The possibility of communicating with those extraterrestrial alien planetary civilizations centers on the high level of technological development that is required to overcome the problem of distance. It is conceivable that advanced civilizations can produce energy at a level of 10 to the 43rd power erg/year and that an artificial biosphere can be developed within the limits of 10 to the 22nd power to 10 to the 23rd power cm. G.G.

N74-32508* Kanner (Leo) Associates, Redwood City, Calif.
RADIO COMMUNICATIONS WITH EXTRA-TERRESTRIAL CIVILIZATIONS **c07**
V. A. Kotelnikov *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 79-82 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 280-282 (For availability see N74-32500 22-04)
CSCL 17B

Communications between civilizations within our galaxy at the present level of radio engineering is possible, although civilizations must begin to search for each other to achieve this. If an extra-terrestrial civilization possessing a technology at our level wishes to make itself known and will transmit special radio signals to do this, then it can be picked up by us at a distance of several hundreds of light years using already existing radio telescopes and specially built radio receivers. If it wishes, this civilization can also send us information without awaiting our answer. Author

N74-32509* Kanner (Leo) Associates, Redwood City, Calif.
SEARCHING FOR EXTRA-TERRESTRIAL CIVILIZATIONS **c30**
L. M. Gindilis *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 83-110 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 283-302 (For availability see N74-32500 22-04)
CSCL 03B

The probability of radio interchange with extraterrestrial civilizations is discussed. Difficulties constitute absorption, scattering, and dispersion of signals by the rarified interstellar medium as well as the deciphering of received signals and convergence of semantic concept. A cybernetic approach considers searching for signals that develop from astroengineering activities of extraterrestrial civilizations. G.G.

N74-32510* Kanner (Leo) Associates, Redwood City, Calif.
LINCOS: AN INTERPLANETARY LANGUAGE **c19**
H. Freudenthal *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 111-127 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 306-317 (For availability see N74-32500 22-04)
CSCL 12A

A language for cosmic contacts is envisioned that utilizes radio signals of different wavelengths as sounds to form words. These words are in most cases abbreviations of Latin words understood from their English and French cognates. The logistic syntax uses pauses for punctuation in a binary system; pairs of algebraic formulas are transmitted where in a such pair the second element is always derived from the first; between them is transmitted a word that is understood as -follows- by the listener. The concepts of difference in position, of motion, of space, and of mass can be mathematically described by this language. G.G.

N74-32511* Kanner (Leo) Associates, Redwood City, Calif.
SPACE AND MAN
E. Kolman *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 128-134 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 318-326 (For availability see N74-32500 22-04)
CSCL 06P

The effects of man's entry into space on changes in economics and technology, politics and law, science, philosophy, and art are considered. A single world economy, extracting from the natural resources of the moon and other cosmic bodies raw materials and energy, will avoid terrestrial limitations and improve society by eliminating the inequalities of economic and social status. However, a spacecraft for interplanetary travel require thermonuclear engines that achieve an escape velocity of 0.1 times the speed of light in order to allow an astronaut stellar expedition corresponding to the active life of a single generation. G.G.

N74-32512* Kanner (Leo) Associates, Redwood City, Calif.
SPACECRAFT OF THE FUTURE **c31**
K. A. Gilzin *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 135-153 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 327-338 (For availability see N74-32500 22-04)
CSCL 22B

Manned interstellar expeditions require future ion propulsion rocket engines able to achieve a flight velocity of 0.3 times the speed of light, and a closed ecological system onboard the interstellar spacecraft that incorporates biological links and complicated technical facilities to insure long term life support for its crew. G.G.

N74-32513* Kanner (Leo) Associates, Redwood City, Calif.
ARE INTERSTELLAR FLIGHTS POSSIBLE? **c30**
B. K. Fedyushin *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 154-160 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 340-344 (For availability see N74-32500 22-04)
CSCL 03B

It is shown that ionic relativistic rockets are most suitable for carrying out interstellar flights in comparison with photonic rockets or nuclear interstellar aircraft. Slow interstellar flights are much more probable than fast flights. G.G.

N74-32514* Kanner (Leo) Associates, Redwood City, Calif.
ARCHITECTURE IN OUTER SPACE **c31**
G. I. Pokrovskiy *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 161-169 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 345-349 (For availability see N74-32500 22-04)
CSCL 22B

Mulilayer thin film structures consisting of systems of shells filled with gas at some pressure are recommended for outer space structures: Large mirrors to collect light and radio waves, protection against meteoric impact and damage, and for connectors between state space stations in the form of orbital rings. It is projected that individual orbital rings will multiply and completely seal a star trapping its high temperature radiation and transforming it into low temperature infrared and short wave radio emission; this radiation energy could be utilized for technological and biological processes. G.G.

N74-32515* Kanner (Leo) Associates, Redwood City, Calif.
SPACE FLIGHTS AND QUESTIONS OF LAW **c30**
E. Pepen *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 170-175 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 352-257 (For availability see N74-32500 22-04)
CSCL 22C

Juridical aspects of space flights and international law are elaborated. Considered are manned orbital space stations, as well as lunar or planetary bases and the international exploration of extraterrestrial resources. G.G.

N74-32516* Kanner (Leo) Associates, Redwood City, Calif.
WHO OWNS THE MOON? **c34**
G. P. Zhukov *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 177-184 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 358-361 (For availability see N74-32500 22-04)
CSCL 05D

It is stipulated that all of mankind owns the moon and that lunar exploration must be exclusively for peaceful purposes. In addition to the right to build stations on the moon, every country has the right to utilize the moon's natural resources. This includes: exploration, extraction, and processing of minerals and other natural resources, and their utilization and processing for local needs and possible also for export to earth. G.G.

N74-32517# Civil Aeromedical Inst., Oklahoma City, Okla.
FLYING HIGH: THE AEROMEDICAL ASPECTS OF MARIJUANA
Mark F. Lewis (New Mexico Univ.) and Douglas P. Ferraro (New Mexico Univ.) Dec. 1973 7 p refs
(AD-775889; FAA-AM-73-12) Avail: NTIS HC $4.00

A summary of the discussions from the GAMI symposium on aeromedical aspects of marijuana is presented. The invited panel discussed the legal aspects of marijuana use and aviation, the experience of military aviation, and the acute and chronic effects of the drug. For civil aviation, the panel proposed: (1) a 12 to 16 hour period between marijuana use and work in aviation, (2) no radical changes in FAA policy towards marijuana use, and (3) additional research on aeromedical aspects of marijuana. Author

N74-32518*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MEASUREMENT OF GAS PRODUCTION OF MICROORGANISMS Patent Application
Judd R. Wilkins, Stacey M. Mills, and Albin O. Pearson, inventors (to NASA) Filed 24 Jul. 1974 20 p
(NASA-Case-LAR-11326-1; US-Patent-Appl-SN-491416) Avail: NTIS HC $4.00 CSCL 06M

A simple apparatus and method are disclosed for measuring gas production by microorganisms using a pressure transducer to sense pressure built-up by members of the ENTEROBACTERIACEAE group of bacteria. The test system consists of a 5.0 psid pressure transducer and a pressure equalizer valve attached to the metal cap of a 20 x 150 mm test tube with gas pressure being recorded on a strip chart recorder. NASA

N74-32519# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
BLOOD-BUBBLE INTERACTION IN DECOMPRESSION SICKNESS
Kenneth N. Ackles, ed. Dec. 1973 301 p refs Presented at an Intern. Symp. at Downsview, Ontario
(DCIEM-73-CP-960) Avail: NTIS HC $18.25

The texts of papers are presented, along with discussion recorded during a conference concerning the pathophysiology and treatment of blood-bubble phenomena during decompression sickness. The following items are among the topics discussed: (1) the historical evolution of the blood-bubble interaction hypothesis; (2) the physiology of blood platelets; (3) biochemical indicators of decompression sickness; (4) the ultrastructure of the blood-bubble interface; (5) experimental evidence in support of the hypothesis that intravascular bubbles activate the hemostatic process; (6) the role of gas embolism in decompression sickness; (7) evaluation of clotting factors during hyperbaric exposure; and (8) the possible effects of bubble induced coagulation following decompression. A.A.D.

N74-32520# Institute of Ophthalmology, London (England). Dept. of Experimental Ophthalomology.
LASERS AND THE ANTERIOR SEGMENT OF THE EYE
E. S. Perkins Nov. 1972 40 p refs
(FPRC/1318) Avail: NTIS HC $5.00

The effects of lasers of different wavelengths on the cornea, lens and iris are described and a comparison is made with a conventional photocoagulator. The production of an iridotomy by a laser is described and its clinical value discussed. Author

N74-32521# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
THE GENERATION OF SACCADIC EYE MOVEMENTS IN VESTIBULAR NYSTAGMUS
G. P. Barnes Sep. 1973 36 p refs
(FPRC/1325) Avail: NTIS HC $5.00

A model has been developed for the mechanism of saccadic generation in the vestibulo-ocular reflex arc, in an attempt to explain variations in the pattern of nystagmic response to vestibular stimulation. The model has been developed using an analogue computer and an attempt has been made to relate the system to the known physiological evidence. Author

N74-32522# Civil Aeromedical Inst., Oklahoma City, Okla.
AVIATION MEDICINE TRANSLATIONS: ANNOTATED BIBLIOGRAPHY OF RECENTLY TRANSLATED MATERIAL, 8
Gregory N. Constant, D. R. Goulden, and E. Jean Grimm Dec. 1973 9 p
(AD-776136; FAA-AM-73-19) Avail: NTIS HC $4.00

An annotated bibliography of translations of foreign language articles is presented. The 22 listed entries are concerned with studies of equilibration tests, vestibular function, opto-kinetic nystagmus, electronystagmography, cardiovascular reactions to noise stress, stress and performance, aptitudes for flying, facial reconstruction techniques in the identification of human remains from accidents, attitudes and performance of air traffic controllers, techniques for determining levels of carbon monoxide in the blood, noise, vision, cardiology, flight safety, and animal responses to sonic booms. Procedures for obtaining copies of the translations are included. Author

N74-32523# Civil Aeromedical Inst., Oklahoma City, Okla.
HEIGHT AND WEIGHT ERRORS IN AEROMEDICAL CERTIFICATION DATA
Michael T. Lategola, Clyde A. Lynn, Earl D. Folk, Charles F. Booze, Jr., and Peggy J. Lyne Jun. 1973 7 p refs
(AD-773452; FAA-AM-73-10) Avail: NTIS HC $4.00

The Framingham Relative Weight Index (FRWI) of obesity was described in previous reports as a screening aid for detecting susceptibility to coronary heart disease (CHD). FRWI calculation requires measured values of height and weight but the height and weight values on standard airman medical applications are usually stated estimates of the examinee. Because such stated (unmeasured) data are vulnerable to error samples from aeromedical certification sources were examined for errors. In a previous study 674 Air Traffic Controllers (ATC) stated their heights at 65 inches or less. Of 216 corborated errors 179 were due to incorrectly stated height. In a separate study, the stated and measured weights, of 206 ATC personnel were compared. Due to weight understatement by grossly overweight individuals, the 120.0% FRWI classification of obesity based on stated weight is quite conservative. Author

N74-32524*# Scientific Translation Service, Santa Barbara, Calif.
TREATMENT OF SYSTEMIC LUPUS ERYTHEMATOSUS WITH NEPHROPATHY BY MEANS OF CHLORAMBUCIL
Washington NASA Aug. 1974 9 p ref Transl. into ENGLISH from Rev. Clin. Espan. (Spain), v. 132, no. 5, 15 Mar. 1974 p 473-474
(Contract NASw-2483)
(NASA-TT-F-15897) Avail: NTIS HC $4.00 CSCL 06E

A review of American and foreign research results is presented with the drug chlorobrucil in the treatment of kidney disease, as well as the side effects. Author

N74-32525*# SCI Systems, Inc., Houston, Tex. Biomedical Engineering Dept.
VIDEO REQUIREMENTS FOR REMOTE MEDICAL DIAGNOSIS Final Report
Jerry G. Davis Jun. 1974 92 p refs
(Contract NAS9-13118)
(NASA-CR-134395) Avail: NTIS HC $7.75 CSCL 06B

Minimal television system requirements for medical telediagnosis were studied. The experiment was conducted with the aid of a simulated telemedicine system. The first step involved making high quality videotape recordings of actual medical examinations conducted by a skilled nurse under the direction of a physician watching on closed circuit television. These recordings formed the baseline for the study. Next, these videotape recordings were electronically degraded to simulate television systems of less than broadcast quality. Finally, the baseline and degraded video recordings were shown (via a statistically randomized procedure) to a large number of physicians who attempted to reach a correct medical diagnosis and to visually recognize key physical signs for each patient. By careful scoring and analysis of the results of these viewings, the pictorial and diagnostic limitations as a function of technical video characteristics were to be defined. Author

N74-32526*# Alabama Univ., Birmingham. Lab. of Molecular Biology.
A MODEL FOR THE COEVOLUTION OF THE GENETIC CODE AND THE PROCESS OF PROTEIN BIOSYNTHESIS Semiannual Progress Report
8 Jan. 1974 19 p refs
(Grant NGR-01-010-001)
(NASA-CR-140018) Avail: NTIS CSCL 06A

Work accomplished toward exploration of a model for the coevolution of the genetic code includes the following: (1) aminoacyl adenylate anhydrides are readily converted in high yield to aminoacyl imidazoles; (2) aminoacyl groups can be transferred from imidazole to polyribonucleotides; (3) peptides can be formed from glycylated poly U; (4) glycyl imidazole is more stable at all pHs than N-acetyl glycyl imidazole; (5) aminoacyl transfer reactions in contemporary biosystems are mediated by histidine residues in enzymes; and (6) intramolecular interactions between amino acid side chains and nucleotide bases have been observed in N-acetylphenylalanyl poly A and poly U as indicated by ultraviolet and circular dichroic spectra. Author

N74-32527*# Scientific Translation Service, Santa Barbara, Calif.
SCREENING OF ANTINUCLEAR FACTORS IN RHEUMATIC DISEASES
H. A. Menard, D. Myhal, M. Camerlain, and A. Lussier Washington NASA Sep. 1974 15 p refs Transl. into ENGLISH from Union Med. Can. (Canada), v. 103, no. 4, 1974 p 722-726
(Contract NASw-2483)
(NASA-TT-F-15843) Avail: NTIS HC $4.00 CSCL 06E

Experience with a screening method for antinuclear antibodies which uses indirect immunofluorescence on formalinized chicken red cells nuclei as substrate is discussed. The method is inexpensive, easy to standardize, easy to perform, and presents a sensitivity and specificity comparable to classical methods. Sera and synovial fluids from patients with rheumatic diseases were screened. A discussion of the technical aspects and the clinical applications is included. Author

N74-32528*# Kanner (Leo) Associates, Redwood City, Calif.
PROJECTIONS OF THE VESTIBULAR NERVES TO THE SUPRASYLVIAN AND POSTCRUCIATE CORTICAL AREAS IN THE CHLORALOSED CAT
M. Roucoux-Hanus and N. Boisacq-Schepens Washington NASA Sep. 1974 23 p refs Transl. into ENGLISH from Arch. Ital. Biol. (Italy), v. 112, 1974 p 60-76
(Contract NASw-2481)
(NASA-TT-F-15900) Avail: NTIS HC $4.25 CSCL 06C

A comparative study of the projection of vestibular afferents to the postcruciate dimple and to the primary vestibular area is given. The results obtained with three different recording methods, revealed a localized site of relatively early vestibular response in the deep cruciate sulcus, and indicated the primary nature of the vestibular projection to the suprasylvian cortex and the abundance of vestibulosomatic convergence in the cortical areas studied. Author

N74-32529# Civil Aeromedical Inst., Oklahoma City, Okla. Medical Statistical Section.
PREVALENCE AND INCIDENCE OF DISEASE AMONG AIRMEN MEDICALLY CERTIFIED DURING 1965
Charles F. Booze, Jr. Apr. 1973 27 p refs
(AD-773544; FAA-AM-73-8) Avail: NTIS HC $3.75

This historical prospective study follows some 306,000 airmen medically certified during 1965 through December 1969 to observe prevalence and incidence of disease among these airmen. It also considers possible contribution of medical factors to attrition of airmen from an active status as a follow-up to a previous study concerning characteristics of airmen involved in attrition. Abdominal and cardiovascular diseases represented the greatest incidence for the total study group and the still active sub-group. Miscellaneous conditions, i.e., skin diseases, endocrinopathies, allergies, and general systemic conditions, were slightly more important among the attrition sub-group. Overall, the attrition subgroup demonstrated the highest prevalence and incidence of disease for the study period. However, 86% of the attrition sub-group had no recorded disease, thus diminishing the apparent importance of medical factors as a primary motivator for attrition. Author

N74-32530*# Harding Coll., Searcy, Ark.
PROGRAM TO STUDY OPTIMAL PROTOCOL FOR CARDIOVASCULAR AND MUSCULAR EFFICIENCY Progress Report, 1 Jan. - 30 Jun. 1974
Harry D. Olree 30 Jun. 1974 33 p refs
(Contract NAS9-14134)
(NASA-CR-140224) Avail: NTIS HC $4.75 CSCL 06P

Training programs necessary for the development of optimal strength during prolonged manned space flight were examined, and exercises performed on the Super Mini Gym Skylab 2 were compared with similar exercises on the Universal Gym and calisthenics. Cardiopulmonary gains were found negligible but all training groups exhibited good gains in strength. Author

N74-32531*# General Electric Co., Houston, Tex. Space Div.
BIOMEDICAL PROGRAMS OPERATIONS PLANS Final Report
H. F. Walbrecher 30 Aug. 1974 193 p
(Contract NAS9-11037)
(NASA-CR-140223) Avail: NTIS HC $12.75 CSCL 06D

Operational guidelines for the space shuttle life sciences payloads are presented. An operational assessment of the medical experimental altitude test for Skylab, and Skylab life sciences documentation are discussed along with the operations posture and collection of space shuttle operational planning data. F.O.S.

N74-32532*# Aerojet Medical and Biological Systems, El Monte, Calif.
CASSETTE BACTERIA DETECTION SYSTEM Final Report
1 Aug. 1974 95 p
(Contract NAS9-13256)
(NASA-CR-140229; Rept-1110F) Avail: NTIS HC $7.75 CSCL 06M

The design, fabrication, and testing of an automatic bacteria detection system, with a zero-g capability, based on the filter-capable approach, and intended for monitoring the sterility of regenerated water in spacecraft is discussed. The principle of detection is based on measuring the increase in chemiluminescence produced by the action of bacterial porphyrins on a luminol-hydrogen peroxide mixture. Viable organisms are detected by comparing the signal of an incubated water sample with an unincubated control. High signals for the incubated water sample indicate the presence of viable organisms. Author

N74-32533*# Kanner (Leo) Associates, Redwood City, Calif.
STUDY OF WEIGHTLESSNESS AND PERTURBATION OF THE RHYTHMS OF THE GASTROINTESTINAL SYSTEM OF ANIMALS AND HUMAN BEINGS
J. Thouvenot and C. Gaudeau Washington NASA Sep. 1974 46 p refs Transl. into ENGLISH of "Etude de l'Agravite et des Perturbations des Rythmes sur le Tractus Gastro-Intestinal chez l'Animal et chez l'Homme", Rept. ESRO-SP73 ESRO Space Biol. Related to the Post-Apollo Programme, Paris, Aug. 1971 p 352-389
(Contract NASw-2481)
(NASA-TT-F-15925; ESRO-SP-73) Avail: NTIS HC $5.50 CSCL 06G

Skin electrodes have been used to study the responses of the gastrointestinal system to weightlessness, with special attention to biorhythms. Future areas of study are outlined,

including comparison of these responses to those of the cardiac, respiratory and nervous systems. The relative usefulness of immersion experiments, the problems of venous pooling and respiratory mechanics during space flight, psychological concerns, possible use of the astronauts to answer questions of cell biology (hair and fingernail growth, wound healing) and the problem of bacteria growth in space, are discussed. Author

N74-32534*# New York Univ., N.Y.
BIOLOGICAL EFFECTS OF RADIATION, METABOLIC AND REPLICATION KINETICS ALTERATIONS Final Report
Joseph Post 31 Dec. 1972 19 p refs
(Grant NGR-33-016-102)
(NASA-CR-139689) Avail: NTIS HC $4.00 CSCL 06R

The biological effects of radiation upon normal and cancerous tissues were studied. A macromolecular precursor of DNA, 3ETdR, was incorporated into the cell nucleus during synthesis and provided intranuclear beta radiation. Tritium labeled cells were studied with autoradiographic methods; cell cycle kinetics were determined and cell functions modified by radiation dosage or by drugs were also evaluated. The long term program has included; (1) effects of radiation on cell replication and the correlation with incorporated dose levels, (2) radiation induced changes in cell function, viz., the response of beta irradiated spleen lymphocytes to antigenic stimulation by sheep red blood cells (SRBC), (3) kinetics of tumor and normal cell replication; and (4) megakaryocyte formation and modification by radiomimetic drugs. Author

N74-32535*# Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.
RESEARCH ON BIOPHYSICAL EVALUATION OF THE HUMAN VESTIBULAR SYSTEM Final Report
L. R. Young Aug. 1974 86 p refs
(Grant NGR-22-009-156)
(NASA-CR-140063) Avail: NTIS HC $7.50 CSCL 06P

The human vestibular function was studied by the combined approach of advanced measurement and mathematical modelling. Fundamental measurements of some physical properties of endolymph and perilymph, combined with nystagmus measurements and fluid mechanical analysis of semicircular canal function furthered the theory of canal mechanical response to angular acceleration, caloric stimulation and relating linear acceleration. The effects of adaptation seen at low frequency angular stimulation were studied and modelled to remove some shortcomings of the torsion pendulum models. Otolith function was also studied experimentally and analytically, leading to a new set of models for subjective orientation. Applications to special problems of space, including the case of rotating spacecraft were investigated and the interaction of visual and vestibular cues and their relation to proprioceptive information was explored relative to postural control. Author

N74-32536*# Little (Arthur D.), Inc., Cambridge, Mass.
EVALUATION OF POSSIBLE INTERACTION AMONG DRUGS CONTEMPLATED FOR USE DURING MANNED SPACE FLIGHTS. PART 1: SUMMARY FROM PROGRESS REPORT DATED 31 OCTOBER 1973. PART 2: PROGRESS REPORT FOR THE PERIOD NOVEMBER 1973 TO JUNE 1974 Final Report, Jul. 1972 - Jun. 1974
31 Jul. 1974 67 p refs
(Contract NAS9-12970)
(NASA-CR-140248; C-74804-PT-1; C-74804-Pt-2) Avail: NTIS HC $6.50 CSCL 06E

Possible interactions among drugs contemplated for use during manned spaceflights have been studied in several animal species. The following seven drugs were investigated: nitrofurantoin, chloral hydrate, hexobarbital, phenobarbital, flurazepam, diphenoxylate, and phenazopyridine. Particular combinations included: chloral hydrate, hexobarbital or flurazepam with nitrofurantoin; phenobarbital or flurazepam with phenazopyridine; and diphenoxylate with two dose formulations of nitrofurantoin. The mechanism of action and an explanation of the interaction between diphenoxylate and nitrofurantoin still remains unclear. In man, the interaction does not appear to be significant, affecting only two subjects out of six and with only one dose formulation (Furadantin). Author

N74-32537*# Kanner (Leo) Associates, Redwood City, Calif.
SPACE RESEARCH IN THE UKRAINE. NO. 4: SPACE BIOLOGY AND MEDICINE
N. N. Sirotinin Washington NASA Sep. 1974 127 p refs Transl. into ENGLISH from Kosmich. Issled. Ukr. (Kiev), no. 4, 1973 p 1-80
(Contract NASw-2481)
(NASA-TT-F-15921) Avail: NTIS HC $9.50 CSCL 06C

The principal extremal effects are discussed to which astronauts may be subjected during space flight: Depressurization and decompression (amounting in the main to anoxia), gravitation and weightlessness, and hypokinesia and kinetosis. The prophylaxis and therapy of these conditions are indicated. Also described are how to provide astronauts with water that is regenerated and preserved under spacecraft conditions and how to cultivate algae that can serve as a source of oxygen and food. Author

N74-32538# Royal Aircraft Establishment, Farnborough (England).
HEARING LOSS DUE TO TANK NOISE
Dieter Wiegand Apr. 1974 25 p refs Transl. into ENGLISH from Erprobungsstelle 41 der Bundeswehr, Trier, 1973
(RAE-Lib-Trans-1748; BR41687) Avail: NTIS HC $4.25

The dependence of hearing loss on exposure to tank noise was investigated. Audiograms were obtained for 81 tank test drivers and 49 engine test bed operators, account being taken of age and exposure duration, and the results for monaural and binaural hearing loss evaluated by various procedures. The results show a high proportion of hearing loss from tank noise. The estimated extent of the hearing loss is dependent on the method of measurement and the procedures used for evaluating hearing loss from the audiogram. It is considered that personal hearing protection against noise is of only limited effectiveness, and measures for reduction must be taken mainly at the noise source itself. Author

N74-32539# European Space Research Organization, Paris (France).
EFFECT OF PRECEDING EXPOSURE TO ALTITUDE ON HIGH PRESSURE DECOMPRESSION IN THE RAT
Klaus Peter Schmalenbach Jun. 1974 50 p refs Transl. into ENGLISH of Tierexptl. Dekompressionsvers. nach Hoehenexposition, DLR-FB-73-87, DFVLR, 3 Jul. 1973
(ESRO-TT-68; DLR-FB-73-87) Avail: NTIS HC $5.50; DFVLR Porz, West Ger. 16.50 DM

Rats were exposed to a simulated altitude of 4000 m for 2, 31, 72, and 168 hours. Rats and a control-series were then rapidly decompressed from 12 kp/sq cm to atmospheric pressure. Comparison of mortalities after decompression showed a significant decrease of the mortality in the rats exposed to altitude for 168 hours. Shorter periods of hypoxia induced no significant effect. The influence of adaptation to altitude on the bubble formation during high pressure decompression and on the post-decompression shock is discussed. Author (ESRO)

N74-32540# European Space Research Organization, Paris (France).
VIBRATION AND ACUTE ANOXIA
Hermann-Josef Erich Lenders Jun. 1974 59 p refs Transl. into ENGLISH of Vibration u. Akuter Sauerstoffmangel, DLR-FB-73-96, DFVLR 6 Aug. 1973
(ESRO-TT-73; DLR-FB-73-96) Avail: NTIS HC $6.00; DFVLR, Porz, West Ger. 18.70 DM

The influence of vibration on the oxygen deficit tolerance was dealt with. In a decompression run to a simulated altitude of 12,000 m, 240 albino rats were exposed to a quasi-sinusoidal oscillation with a frequency of 34 Hz and an amplitude of 1,075 mm. The result was a significant increase of the mortality rate of the vibrated rats as compared with control animals. Possible causal factors underlying the experimental results are discussed. Author (ESRO)

N74-32541# Perceptronics, Inc., Woodland Hills, Calif.
ADAPTIVE COMPUTER AIDING IN DYNAMIC DECISION PROCESSES. PART 1: ADAPTIVE DECISION MODELS AND DYNAMIC UTILITY ESTIMATION Semiannual Technical Report, 1 Oct. 1973 - 1 Apr. 1974

Amos Freedy, Richard Weisbrod, Kent Davis, Donald May, and Gershon Weltman 1 May 1974 64 p refs
(Contract N00014-73-C-0286; ARPA Order 2347; NR Proj. 196-128)
(AD-780953; PTR-1016-74-5(1); SATR-4) Avail: NTIS CSCL 05/10

The report describes the implementation of a system for adaptive computer aiding in dynamic decision processes and provides theoretical background for some of the underlying techniques. The report is presented in two parts under separate covers. Part I, Adaptive Decision Models and Dynamic Utility Estimation, includes (1) a description of the adaptive decision model for the decision task; (2) a presentation of the concept of dynamic utility and a technique, based on machine learning principles, for adaptive on-line estimation of these utilities; (3) a description of the overall system and software; and (4) the overall objectives and approach for an experimental program involving the system. (Modified author abstract) GRA

N74-32542# Kentucky Univ., Lexington. Wenner-Gren Research Lab.
A STANDARD PSYCHOPHYSIOLOGICAL PREPARATION FOR EVALUATING THE EFFECTS OF ENVIRONMENTAL VIBRATION STRESS. PHASE 2: IMPLEMENTATION
E. P. McCutcheon, R. G. Edwards, J. M. Evans, J. F. Lafferty, and D. F. McCoy Feb. 1974 192 p refs
(Contract F33615-72-C-1112; AF Proj. 7231)
(AD-781092; AMRL-TR-73-118) Avail: NTIS CSCL 06/19

A Standard Psychophysiological Preparation (SPP) for the evaluation of the physiological and biomechanical mechanisms responsible for performance decrement during repeated, long term exposure to vibration has been developed. The SPP is comprised of a trained Rhesus monkey, chronically implanted with probes to measure cardiovascular, hormonal and thermal parameters, with provisions for external measurements of the ECG, skin temperature, oxygen consumption, biomechanical parameters and performance level. Implementation of the SPP concept verifies the applicability and utility of the SPP and demonstrates the high quality, quantitative physiological and biomechanical data can be obtained with multiple systems from a performing subject during vibration exposure. Performance level, cardiovascular parameters, and biomechanical response of the SPP are presented as a function of vibration frequency and acceleration amplitude.
Author (GRA)

N74-32543# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
PROCEEDINGS OF THE 4TH ANNUAL CONFERENCE ON ENVIRONMENTAL TOXICOLOGY Final Report
Dec. 1973 438 p refs Conf. held at Fairborn, Ohio, 16-18 Oct. 1973
(Contract F33615-73-C-4059; AF Proj. 6302)
(AD-781031; AMRL-TR-73-125) Avail: NTIS CSCL 06/20

The report is a compilation of the papers presented at the Proceedings of the 4th Annual Conference on Environmental Toxicology, sponsored by the University of California, Irvine and held in Fairborn, Ohio on 16, 17, and 18 October 1973. Major technical areas discussed included Toxic Substance Control Act of 1973: toxicology of halogenated solvents, aerosol propellants, and fire extinguishants: and toxicology of propellant, materials and assessment of carbinogenesis to certain materials.
Author (GRA)

N74-32544# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ANALYSIS OF THE DYNAMIC RESPONSE OF THE HUMAN VERTEBRAL COLUMN M.S. Thesis
George M. P. Marton Mar. 1974 102 p refs
(AD-780627; GAW/MC/74-6) Avail: NTIS CSCL 06P

The development of a model of the human vertebral column is investigated. The model is assumed to consist of only linear elements and only axial response is considered. The intervertebral disc is modelled by a chain of Kelvin elements in series with an impact spring. The vertebra is modelled by a Maxwell element in parallel with a spring and in series with a mass. The response of the model is shown to correspond closely to impedance results at the elemental level but the model of the combination of three vertebrae and two discs gives results which are low when compared to experimental impedance results.
Author (GRA)

N74-32545# Naval Aerospace Medical Research Lab., Pensacola, Fla.
INDIVIDUAL DIFFERENCES IN VESTIBULAR INFORMATION AS A PREDICTOR OF MOTION DISTURBANCE SUSCEPTIBILITY
H. J. Moore and Fred E. Guedry, Jr. 23 Apr. 1974 23 p refs
(AD-781881; NAMRL-1200; USAARL-74-11) Avail: NTIS CSCL 05/10

Certain facts suggest that motion disturbance may be related to the amount of vestibular information contributing to sensory conflict. Individual differences in motion disturbance susceptibility might, therefore, correlate positively with differential accessibility of vestibular sensory information to the spatial perceptual process. The results of two experiments, while not inconsistent with this hypothesis, did not demonstrate a relationship between a vestibular response variance measure and motion disturbance susceptibility at the conventional significance level. The test-retest reliability of the response variance measure was not found to be favorable. The slope of the vestibular stimulus-response relationship was not found to predict motion disturbance susceptibility.
Author (GRA)

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N74-32546* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FLEXIBLE JOINT FOR PRESSURIZABLE GARMENT Patent
William Elkins (Garrett Corp., Los Angeles), Eugene W. Connell (Garrett Corp., Los Angeles), and Robert E. Alesna, inventors (to NASA) (Garrett Corp., Los Angeles) Issued 3 Sep. 1974 10 p Sponsored by NASA
(NASA-Case-MSC-110/72; US-Patent-3,832,735; US-Patent-Appl-SN-689455; US-Patent-Class-2-2.1A; US-Patent-Class-2-82; US-Patent-Class-156-218) Avail: US Patent Office CSCL 06Q

A flexible joint for a pressurizable garment is described which has two fabric layers bonded together. The lay of one layer is straight cut and the other of bias cut. A ring-like tension member covered with Teflon disposed at the minor diameter of each joint convolution, is unrestrained other than being retained in the flexure plane. A compression ring is secured at the major diameter, at certain of the convolutions, preferably alternate ones. A pair of axially disposed cable joint restraints at the convolution periphery are disposed in a plane normal to the flexure plane.
Official Gazette of the U.S. Patent Office

N74-32547 Radiotechniques S. A., Caen (France). Lab. de Recherches et de Developpements Avances.
APPLICATION OF SEMICONDUCTOR MICROPROBES TO CARDIOVASCULAR AND RENAL HEMODYNAMICS Final Report [APPLICATION DES MICROCAPTEURS A SEMICONDUCTEUR A L'ETUDE DE L'HEMODYNAMIQUE CARDIOVASCULAIRE ET RENALE]
G. Forcinal 2 Jul. 1973 46 p In FRENCH
(Contract DGRST-72-70-067)
Avail: Issuing Activity

The development of a semiconductor for in vivo recording krypton 85 beta emission is presented. The mechanical, electrical, and nuclear requirements are reviewed together with principles of the specific semiconductor detector type considered and problems associated with radiation counting in continuous media. The technologies used are detailed and compared with a view to choosing between lithium outside or boron outside. The results obtained with lithium outside probes are discussed with regard to stability, efficiency, charge preamplifiers, and power supplies. Problems encountered during in vivo experiments are detailed

with regard to grounding and signal filtering. Applications to cardiovascular and renal hemodynamics are contemplated for which the achieved counting rate of 50 counts/sec/microcurie/milliliter seems correct. ESRO

N74-32548*# Pillsbury Mills, Inc., Minneapolis, Minn.
SPACE SHUTTLE FOOD SYSTEM STUDY. VOLUME 1: SYSTEM DESIGN REPORT Final Report
[1974] 104 p refs
(Contract NAS9-13138)
(NASA-CR-134374) Avail: NTIS HC $8.25 CSCL 06H

Data were assembled which define the optimum food system to support the space shuttle program, and which provide sufficient engineering data to support necessary requests for proposals towards final development and installment of the system. The study approach used is outlined, along with technical data and sketches for each functional area. Logistic support analysis, system assurance, and recommendations and conclusions based on the study results are also presented. Author

N74-32549*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MULTIPARAMETER VISION TESTER Patent Application
Stacey R. Hunt (GE), Robert J. Homkes (GE), Wilmer B. Poteate (GE), and Andrew C. Sturges, inventors (to NASA) (GE) Filed 10 Sep. 1973 72 p
(Contract NASw-1630)
(NASA-Case-MSC-13601-2; US-Patent-Appl-SN-395495) Avail: NTIS HC $6.75 CSCL 06B

A compact optical vision testing unit is reported for testing a relatively large number of physiological characteristics of the eyes and visual system of a human subject. The tester can be used in a number of civilian and industrial applications to provide several complex optical tests having conflicting position and movement requirements in a single compact and integrated unit. The various optical assemblies and devices located within the unit are provided with automatic control mechanisms which may be readily controlled by a programmed computer. NASA

N74-32550*# Life Systems, Inc., Cleveland, Ohio.
SIX-MAN, SELF-CONTAINED CARBON DIOXIDE CONCENTRATOR SYSTEM Final Report
J. D. Powell, F. H. Schubert, R. D. Marshall, and J. W. Shumar Jun. 1974 131 p refs
(Contract NAS2-6478)
(NASA-CR-114743; LSI-ER-134-32) Avail: NTIS HC $9.75 CSCL 06K

A six man, self contained electrochemical carbon dioxide concentrating subsystem was successfully designed and fabricated. It was a preprototype engineering model designed to nominally remove 6.0 kg (13.2 lb) CO_2/day with an inlet air CO_2 partial pressure of 400 N/sq m (3 mm Hg) and an overcapacity removal capability of 12.0 kg (26.4 lb) CO_2/day. The design specifications were later expanded to allow operation at space station prototype CO_2 collection subsystem operating conditions. Author

N74-32551# Civil Aeromedical Inst., Oklahoma City, Okla.
PHYSIOLOGICAL, BIOCHEMICAL, AND PSYCOHLOGICAL RESPONSES IN AIR TRAFFIC CONTROL PERSONNEL: COMPARISON OF THE 5-DAY AND 2-2-1 SHIFT ROTATION PATTERNS
C. E. Melton, J. M. McKenzie, R. C. Smith, B. D. Polis, E. A. Higgins, S. M. Hoffmann, G. E. Funkhouser, and J. T. Saldivar Dec. 1973 16 p refs
(AD-778214; FAA-AM-73-22) Avail: NTIS HC $4.00

Stress in controllers on the straight 5-day shift was determined at Houston Intercontinental Tower in 1970. In 1971 controllers on the 2-2-1 rotation were studied at the same tower. Controllers generally prefer the 2-2-1 to the straight 5-day schedule because of the long weekend associated with the 2-2-1. Management is concerned that the quick turnaround on the 2-2-1 is a stressor that could compromise job performance. Physiological and psychological assessments showed no significant stress differences on the two schedules. On neither of the schedules did the controllers' stress levels differ from the general population. Urine and blood analysis showed that day work on the 5-day rotation was generally more stressful than was the 2-2-1. Stress differences on the two rotation patterns were too slight to be of real significance and a choice between them would have to rest on managerial considerations rather than biomedical ones. Author

N74-32552*# National Aeronautics and Space Administration. Pasadena Office, Calif.
RAW LIQUID WASTE TREATMENT SYSTEM AND PROCESS Patent Application
Marshall F. Humphrey, inventor (to NASA) (JPL) Filed 27 Aug. 1974 33 p
(Contract NAS7-100)
(NASA-Case-NPO-13573-1; US-Patent-Appl-SN-501014) Avail: NTIS HC $4.75 CSCL 06I

A raw sewage treatment process is disclosed in which substantially all the non-dissolved matter, suspended in the sewage water is first separated from the water, in which at least organic matter remains dissolved. The non-dissolved material is pyrolyzed to form an activated carbon and ash material without the addition of any conditioning agents. The activated carbon and ash material is added to the water from which the non-dissolved matter was removed. The activated carbon and ash material adsorbs the organic matter dissolved in the water and is thereafter supplied in a counter flow direction and combined with the incoming raw sewage to at least facilitate the separation of the non-dissolved settleable materials from the sewage water. Carbon and ash material together with the non-dissolved matter which was separated from the sewage water are pyrolyzed to form the activated carbon and ash material. Author

N74-32553*# DeBell and Richarson, Inc., Enfield, Conn.
WASH WATER SOLIDS REMOVAL SYSTEM STUDY Final Report, 20 Jun. 1973 - 22 Jul. 1974
Jul. 1974 66 p refs
(Contract NAS9-13536; Proj. 6037.3)
(NASA-CR-140204) Avail: NTIS HC $6.50 CSCL 06I

During wash water purification, surfactants tend to precipitate and foul the RO membranes, causing water flux decline and loss of salt rejection. The use of 165 to 190 ppm ferric chloride and optionally 0.25 to 1.0 ppm polymeric floccultant precipitates 92 to 96 percent of the surfactant from an Olive Leaf Soap based wash water. Crossflow filtration and pressure filtration yield good soap rejection at high water flux rates. Post-treatment of the chemically pretreated and filtered wash water with activated charcoal removes the residual soap down to an undetectable level. Author

N74-32554# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Biosciences Div.
EFFECT OF ARCTIC CLOTHING ON A SHORT-DURATION TASK
C. L. Allen and S. D. Livingstone Oct. 1973 9 p refs
(DCIEM-73-R-974) Avail: NTIS HC $4.00

The performance of individuals participating in a short duration task while wearing Arctic clothing was compared to their performance while wearing light combat clothing. It was found that although there was an increase in the time to complete the task while wearing the Arctic clothing there was no difference in the energy cost. Author

N74-32555# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
THE MEASUREMENT OF BLOOD VELOCITY WITH LASER ANEMOMETRY
N. S. Vlachos and J. H. Whitelaw Mar. 1974 21 p refs Presented at Workshop on Laser Velocimetry, Lafayette, Ind., Mar. 1974
(HTS/74/13) Avail: NTIS HC $4.25 CSCL 06B

Velocity measurements, obtained with laser anemometry in smallbore glass tubes containing whole blood and saline in varying concentrations up to whole blood, are presented. The corresponding Doppler signals demonstrate the presence of multi-signal scattering in the whole blood and suggest that measurements are unobtainable for tube diameters greater than 250 micron. Related optical and signal-processing problems are discussed. It is concluded that local measurements of blood velocity in venules should be possible provided the venule diameter does not exceed 200 micron. Author

N74-32556# National Aviation Facilities Experimental Center, Atlantic City, N.J.
MAN/MACHINE RELATIONSHIP IN NATIONAL AIRSPACE SYSTEM: PLAN VIEW DISPLAY POSITIONING Interim Report, Jul. - Sep. 1973
Richard Sulzer and Gloria Karsten Mar. 1974 37 p refs
(FAA Proj. 121-105-020)
(AD-776675; FAA-NA-73-90; FAA-RD-74-27) Avail: NTIS HC $3.25

An attempt was made to determine (1) the best angle that the plan view display (PVD) may be inclined while still permitting efficient operation with shrimpboats, (2) the properties of a feasible shrimpboat that will not slide so much as to produce loss of association with the target when used at the proposed angle of elevation, and (3) the properties of a feasible add-on device for fixing the PVD at the angle proposed. Several shrimpboat designs were fabricated and tested at 20 deg, 25 deg, and 30 deg PVD inclinations, both in ideal conditions and in a simulated control situation with air traffic controllers. Shrimpboat model F, arrow-shaped, approximately 1 3/4 inch by 1 inch and 1/16 inch thick, standing on four dabs of silicone, showed best adherence (least slip). The more conventional model A, wedge-shaped, smaller but thicker, was preferred by controllers, but this model was the worst in slip tests. Only at the least steep PVD position was the model A stable. At 25 deg all shrimpboats except A were satisfactory in stability; hence, the 25 deg angle was recommended for the PVD. A simple extension for the leg position bumper was designed and tested to produce the change from a horizontal PVD position, actually 7 deg, to the recommended 20 deg slant. Author

N74-32557*# Technology, Inc., Houston, Tex. Life Sciences Div.
FLIGHT FEEDING SYSTEMS DESIGN AND EVALUATION Final Report, 1 Oct. 1968 - 31 Jan. 1973
Clayton S. Huber 31 Jan. 1973 117 p refs
(Contract NAS9-8927)
(NASA-CR-140192) Avail: NTIS HC $9.00 CSCL 06K

The Apollo flight menu design is fully recounted for Apollo missions 7 through 17, to show modifications that were introduced to the Apollo food system, to document the range of menus and nutritional quality, and to describe packaging and preparation procedures for each class of food item. Papers concerning the Apollo 14 food system, and nutrition systems for pressure suits are included, and the following special topics are treated in depth: (1) food handling procedures; (2) modification of the physical properties of freeze dried rice; (3) stabilization of aerospace food waste; and (4) identification and quantitation of hexadecanal and octadecanal in broiler muscle phospholipids. A.A.D.

N74-32558*# Technology, Inc., Houston, Tex. Life Sciences Div.
FLIGHT FEEDING SYSTEMS DESIGN AND EVALUATION. SUPPLEMENT 1: PRODUCTION GUIDES Final Report, 1 Oct. 1968 - 31 Jan. 1973
31 Jan. 1973 299 p
(Contract NAS9-8927)
(NASA-CR-140193) Avail: NTIS HC $18.00 CSCL 06K

The requirements for processing, packaging, testing, and shipment of foods selected for use in the Apollo food system are presented. Specific foodstuffs chosen from the following categories are discussed: (1) soups; (2) juices; (3) breads; (4) meat and poultry products; (5) fruits and nuts; (6) desserts; and (7) beverages. Food procurement for the mobile quarantine facility and for Apollo preflight and postflight activities is also discussed. A.A.D.

N74-32559*# Linguistic Systems, Inc., Cambridge, Mass.
THE ROLE OF PERIPHERAL VISION AND VISUAL VESTIBULAR INTERACTIONS IN THE EXOCENTRIC PERCEPTION OF LINEAR MOVEMENT IN HUMANS
Alain Berthoz, Bernard Pavard, and Lawrence Young Washington NASA Aug. 1974 8 p refs Transl. into ENGLISH from Compt. Rend. Hebdomadaires Acad. Sci. (France), Ser. D, v. 278, 1974 p 1605-1608
(Contract NASw-2482)
(NASA-TT-F-15737) Avail: NTIS HC $4.00 CSCL 05E

The presentation, at the periphery of the visual field, of a scene animated by linear movement, induces a sense of linear displacement of the body in a direction opposite to that of the moving scene. The latencies, thresholds, and saturation limits of this phenomenon are described quantitatively, as well as the dynamic relations between the change of speed of the visual scene and the speed of the subject's displacement. Some modifications of the vestibular evaluation of the linear movement were observed. Author

N74-32560*# Boeing Aerospace Co., Seattle, Wash.
DEGRADATION OF LEARNED SKILLS. STATIC PRACTICE EFFECTIVENESS FOR VISUAL APPROACH AND LANDING SKILL RETENTION
Thomas E. Sitterley May 1974 46 p refs
(Contract NAS9-13550)
(NASA-CR-140225; D180-17876-1) Avail: NTIS HC $5.50 CSCL 05I

The effectivess of an improved static retraining method was evaluated for a simulated space vehicle approach and landing under instrument and visual flight conditions. Experienced pilots were trained and then tested after 4 months without flying to compare their performance using the improved method with three methods previously evaluated. Use of the improved static retraining method resulted in no practical or significant skill degradation and was found to be even more effective than methods using a dynamic presentation of visual cues. The results suggested that properly structured open loop methods of flight control task retraining are feasible. Author

N74-32561*# General Electric Co., Philadelphia, Pa. Space Div.
SOLID METABOLIC WASTE TRANSPORT AND STOWAGE INVESTIGATION Technical Report, 1 Jun. 1973 - 31 May 1974
R. A. Burt, M. G. Koesterer, and S. R. Hunt, Jr. 21 Aug. 1974 361 p refs
(Contract NAS9-13518)
(NASA-CR-140227; Doc-74SD4221) Avail: NTIS HC $21.25 CSCL 06I

The basic Waste Collection System (WCS) design under consideration utilized air flow to separate the stool from the WCS user and to transport the fecal material to a slinger device for subsequent deposition on a storage bowel. The major parameters governing stool separation and transport were found to be the area of the air inlet orifices, the configuration of the air inlet orifice and the transport air flow. Separation force and transport velocity of the stool were studied. The developed inlet orifice configuration was found to be an effective design for providing fecal separation and transport. Simulated urine tests and female user tests in zero gravity established air flow rates between 0.08 and 0.25 cu sm/min (3 and 9 scfm) as satisfactory for entrapment, containment and transport of urine using an urinal. The investigation of air drying of fecal material as a substitute for vacuum drying in a WCS breadboard system showed that using baseline conditions anticipated for the shuttle cabin ambient atmosphere, flow rates of 0.14 cu sm/min (5 cfm) were adequate for drying and maintaining biological stability of the fecal material. Author

N74-32562*# Scientific Translation Service, Santa Barbara, Calif.
ON THE PROBLEM OF SELF-PURIFICATION OF AIR IN SEALED COMPARTMENTS WITH LIMITED VENTILATION
E. M. Rogozina and A. M. Kozik Washington NASA 23 Sep. 1974 8 p refs Transl. into ENGLISH from Gig. Sanit. (USSR), no. 5, May 1974 p 43-45
(Contract NASw-2483)
(NASA-TT-F-15923) Avail: NTIS HC $4.00 CSCL 06K

The action of human metabolites, such as carbon monoxide, carbon dioxide, ammonia, phenol, and hydrogen sulfide, in the atmosphere of a hermetically sealed room was studied. The surfaces of the room are cooler than the air, and thus condensation forms at the rate of 160 to 250 g/hour/sq m. At various intervals during the 72 hour experiment, condensation from the room surfaces was analyzed; the results are shown in three charts. It appears that the substances which are water soluble, i.e., acetone, phenol, ammonia, and hydrogen sulfide, are removed from the air in the condensate, while carbon monoxide and

carbon dioxide remain in the atmosphere. The amount of water in the air released by human subjects at rest or during light work is sufficient to dissolve significant quantities of water soluble metabolites and thus, to a certain extent, purifies the air.
Author

N74-32563*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DEVELOPMENT AND APPLICATION OF RIDE-QUALITY CRITERIA
David G. Stephens Sep. 1974 12 p refs
(NASA-TM-X-72008) Avail: NTIS HC $3.00 CSCL 05E

Ride quality vibration criteria applicable to the design and evaluation of air and surface transportation systems are described. Consideration is given to the magnitude of vehicle vibration experienced by the passenger, the frequency of vibration, the direction of vibration measurements are presented for a variety of air and surface transportation systems. In addition, simulator data on seat dynamics and passenger response are presented. Results suggest the relative merits of various physical descriptors and measurement locations for characterizing the vibration in terms suitable for the design and/or evaluation of transportation systems. Author

N74-32564*# Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
PRELIMINARY FLIGHT PROTOTYPE WASTE COLLECTION SUBSYSTEM Final Report
Joseph E. Swider, Jr. Apr. 1974 227 p
(Contract NAS9-12938)
(NASA-CR-140240; SVHSER-6509) Avail: NTIS HC $14.50 CSCL 06I

The zero gravity test program demonstrated the feasibility and practicability of collecting urine from both male and female crew members in a zero gravity environment in an earthlike manner not requiring any manual handling of urine containers. In addition, the testing demonstrated that a seat which is comfortable in both regimes of operation could be designed for use on the ground and in zero-gravity. Further, the tests showed that the vortex liquid/air separator is an effective liquid/air separation method in zero gravity. Visual observations indicate essentially zero liquid carry over. The system also demonstrated its ability to handle post elimination wipes without difficulty. The designs utilized in the WCS were verified as acceptable for usage in the space shuttle or other space vehicles. Author

N74-32565# Atomic Energy Commission, Washington, D.C. Div. of Waste Management and Transportation.
HIGH LEVEL RADIOACTIVE WASTE MANAGEMENT ALTERNATIVES
May 1974 94 p refs
(WASH-1297) Avail: NTIS HC $5.45

A summary of a comprehensive overview study of potential alternatives for long term management of high level radioactive waste is presented. The concepts studied included disposal in geologic formations, disposal in seabeds, disposal in ice caps, disposal into space, and elimination by transmutation. NSA

N74-32566# Los Alamos Scientific Lab., N.Mex.
SELECTION OF RESPIRATOR TEST PANELS REPRESENTATIVE OF US ADULTS FACIAL SIZES
A. Hack, E. C. Hyatt, B. J. Held, T. O. Moore, and C. P. Richards Dec. 1973 32 p refs Sponsored in part by Natl. Inst. for Occupational Safety and Health, Cincinnati
(Contract W-7405-ENG-36; AEC Proj. M-020; Proj. R-061; Proj. R-072)
(LA-5488) Avail: NTIS HC $4.00

Anthropometric specifications are reported for subjects to test the fit of half mask, quarter mask, and full facepiece respirators. Subjects were selected on the basis of face length and face width to wear full face masks in tests. For testing half and quarter masks, face length and lip length were used. Test panels containing 25 male and female subjects were used to represent a majority of the working population. A sequential sampling scheme was developed to reduce the amount of testing required to determine if a mask provides adequate protection for different facial sizes. Examples of man test results are given.
Author (NSA)

N74-32567# Posterijen, Telegrafie en Telefonie, The Hague (Netherlands). Dr. Neher Lab.
ERGONOMIC ASPECTS OF THE DESIGN OF A CONSOLE [ERGONOMISCHE ASPECTEN BIJ HET ONTWERP VAN EEN MEETTAFEL]
J. A. VanOoster Jan. 1972 35 p refs In DUTCH
(SL-282) Avail: NTIS HC $4.75

Ergonomic factors influencing the operation of man console systems are discussed. The design of a console for telecontrol of telephone and data communications is dealt with, including position and choice of operating devices and visual aids. ESRO

N74-32568# McDonnell-Douglas Astronautics Co., Richland, Wash. Donald W. Douglas Labs.
IMPLANTED ENERGY CONVERSION SYSTEM Annual Report, 8 Jul. 1972 - 8 Jul. 1973
R. P. Johnston Jul. 1973 104 p refs
(Contract PH-43-67-1408-D)
(PB-231008/4; MDC-G4418) Avail: NTIS HC $4.50 CSCL 06L

Progress toward developing an implantable power source for an artificial heart based on the Stirling cycle principle is described. During recent acute animal implant tests spanning up to 28 hours, a completely implanted radioisotope-fueled power source achieved full ventricle relief without external power or control while assuming the full pumping load of the arterial side of the cardiovascular system. Bench tests show that the power source provides ventricle relief at blood flow to 10 liters/minute. The engine operated continuously at designed power for over seven months (greater than 5000 hours) during an electrically heated laboratory life test. GRA

N74-32569# Human Resources Research Organization, Alexandria, Va.
SIMULATION AND AIRCREW TRAINING AND PERFORMANCE
Wallace W. Prophet and Paul W. Caro Apr. 1974 14 p refs Presented at OCRD Conf., Fort Rucker, Ala., Nov. 1973
(AD-780688; HumRRO-PP-4-74) Avail: NTIS CSCL 05/9

The paper outlines some major areas of use of simulation in Army Aviation and comments on current research. Equipment development, crew performance studies, concept development and training are discussed. Only in the training area has the Army made substantial progress. A broad program of simulation research with emphasis on engineering and behavior is suggested toward the goal of improving aircrew performance. There are significant simulation research problems unique to the Army which need to be worked out. Author (GRA)

N74-32570# Operations Research, Inc., Silver Spring, Md.
ASSESSMENT OF MODIFICATIONS TO THE EXPERIMENTAL DISTRESS ALERTING AND LOCATING SYSTEM Final Report
E. Feinberg, P. Steen, D. McGregor, M. Cornell, and J. Brown Dec. 1973 107 p
(Contract DOT-CG-31446-A)
(AD-780599; USCG-D-73-74) Avail: NTIS CSCL 06/7

The report documents a study of modifications required to allow for the use of the experimental Distress Alerting and Locating System (DALS) as a preoperational SAR system. In particular, the following areas are addressed: Multiple access and false alarms in an attempt to prevent system saturation; Automatic deployment techniques for the user device (hand-held unit); Situation coding to describe emergency status of distressed vessel/person; The feasibility of a frequency modification for operation on an allocated safety and distress frequency; Repackaging techniques incorporating a non-destruct antenna, long shelf life batteries and a sealed (environmentally protected) case; and The desirability and feasibility of adding to the distress device an on-air indicator and/or a response to your call indication. Author (GRA)

N74-32505* Kanner (Leo) Associates, Redwood City, Calif.
LUNAR MICROCOSMOS
N. Pirie *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 53-61 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 258-265 (For availability see N74-32500 22-04)
CSCL 06K

06 CHEMISTRY

Includes chemical analysis and identification (e.g. spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N74-32571 Plastimer Usine, Villers Saint Paul (France).
NON SATURATED POLYESTER CORROSION RESISTANCE TESTING BY DIELECTRIC METHODS Final Report [METHODES DIELECTRIQUES D'ETUDE DE LA TENUE DES POLYESTERS INSATURES AUX AGENTS CORROSIFS]
M. Surma, A. Zalmanski, and L. Rechner (Conservatoire Natl. d'Arts et Metiers) Jul. 1973 77 p refs In FRENCH
(Contract DGRST-71-7-3198-00-221-75-01)
Avail: Issuing Activity

The chemical resistance of non-saturated polyester resins reticulated by styrene was studied by ponderomotive and mechanical methods (pendular elasticity modules). These classical corrosion test methods were completed by dielectric measurements to follow variations of the specific induction coefficient and the dissipation factor of copolymers after water treatment and attack by diluted solutions of acetic, sulfuric, nitric, and chlorohydric acids and sodium hydroxide at 85 C. the structural modifications of copolymers during the adsorption and desorption processes make it possible to specify mechanisms of degradation and test polymerization of the copolymers. Dielectric measurements permit the determination of variations connected with future degradation not detectable by classical control methods. These methods are also useful to check the residual insulating capability of copolymers after temperature accelerated chemical attack. ESRO

N74-32572 Institut Francais du Petrole, Rueil-Malmaison. Service Catalyseurs.
PREPARATION AND CATALYTIC PERFORMANCE OF VARIOUS METALLIC COMBINATIONS ON SUBSTRATES Final Report [RECHERCHES DE BASE SUR LA PREPARATION ET LES PERFORMANCES CATALYTIQUES DE DIVERSES COMBINAISONS METALLIQUES SUPPORTEES]
J. Cosyns and J. F. LePage Oct. 1973 24 p refs In FRENCH
(Contract DGRST-72-7-0035)
Avail: Issuing Activity

The preparation, physico chemical characterization and catalytic performance of bimetallic catalyzers placed on a substrate are reported. One of the metals is a group VIII noble metal. The preparation methods to obtain the highly dispersed metallic phases are detailed with regard to ion exchange properties of mineral substrates. These phases were studied using chemisorption X-ray diffraction, ESCA methods. Positive synergic effects in regard to activity in hydrogenation and selectivity in regard to hydrogenolysis are discussed. Improvements in paraffin dehydrogenation are detailed, and applications are reviewed with regard to reforming catalyzers improvement. ESRO

N74-32573*# Horizons, Inc., Cleveland, Ohio.
DEVELOPMENT OF THERMALLY STABLE PHOSPHONITRILE ELASTOMERS FOR ADVANCED AEROSPACE STRUCTURES Annual Summary Report, 24 Apr. 1972 - 24 Jun. 1973
Kennard A. Reynard, Arthur H. Gerber, Thomas Peterson, and Selwyn H. Rose Nov. 1973 48 p refs
(Contract NAS8-25184)
(NASA-CR-120249; ASR-3) Avail: NTIS HC $5.50 CSCL 07C

Both high and low molecular weight, curable poly(fluoroalkoxy phosphazene) terpolymers were prepared. These terpolymers resulted from reaction of (Cl2PNn) polymer with alkoxides derived from CF3CH2OH and C3F7CH2OH, and an alkoxide derived from CH3CH(OH)C2H4OH. The terpolymers were crosslinked with polyisocyanates at room temperature. High molecular weight materials were converted into isocyanate prepolymers which as films underwent moisture cures at room temperature. Prepolymer solutions were stable for several days, and showed good adhesion. Also the effects of polymerization of (Cl2PN)3 were studied. Purified octachlorophosphazene, thiocyanate salts, or hydrogen chloride were employed in attempts to decrease molecular weight. Hydrogen chloride was found to be a good agent for preparation of low molecular weight poly(dichloro phosphazene). Author

N74-32574*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ABSOLUTE RATE PARAMETERS FOR THE REACTION OF GROUND STATE ATOMIC OXYGEN WITH CARBONYL SULFIDE
R. Bruce Klemm and Louis J. Stief Aug. 1974 27 p refs Submitted for publication
(NASA-TM-X-70749; X-691-74-249) Avail: NTIS HC $4.50 CSCL 07D

The rate parameters for the reaction of O(3P) with carbonyl sulfide, O(3P) + OCS yields CO + SO have been determined directly by monitoring O(3P) using the flash photolysis-resonance fluorescence technique. The value for k sub 1 was measured over a temperature range of 263 - 502 K and the data were fitted to an Arrhenuis expression with good linearity. Author

N74-32575*# Institute for Research, Inc., Houston, Tex.
ELECTROCHEMICAL APPROACH FOR PASSIVATING STEEL AND OTHER METALS AND FOR THE SIMULTANEOUS PRODUCTION OF A BIOCIDE TO RENDER WATER POTABLE Final Report
30 Jul. 1972 28 p
(Contract NAS9-12042)
(NASA-CR-140196) Avail: NTIS HC $4.50 CSCL 07D

Potentiostatic polarization curves indicated that the cathodic reactions in deaerated KI-I2 water solutions were due to iodine reduction and hydrogen evolution. In the presence of oxygen an additional reduction wave appeared. Anodic polarization curves revealed that iodine could be produced in the region of potential from +600 to +1000 nv vs. SCE. Author

N74-32576*# Houston Univ., Tex. Dept. of Chemistry.
SPECTROSCOPIC AND PHOTOCHEMICAL STUDY OF MOLECULES IMPORTANT IN CHEMICAL EVOLUTION Annual Report, 15 Jul. 1972 - 15 Jul. 1973
Ralph S. Becker 24 Jul. 1973 30 p
(Grant NGR-44-005-091)
(NASA-CR-140010) Avail: NTIS HC $4.50 CSCL 07D

The primary broad goals of this research are to investigate (1) the possible reactions responsible for generation of compounds important in chemical evolution, and (2) reactions of compounds important in chemical evolution. In both cases the interest includes molecules that exist in interstellar space as well as those present on or near other planets and those which were thought to be present on or near the primitive earth. Author

N74-32577*# Techtran Corp., Glen Burnie, Md.
POLAROGRAPHY OF MOLTEN SALTS
Y. K. Delimarskiy Washington NASA Aug. 1974 26 p refs Transl. into ENGLISH from Usp. Khim. (USSR), v. 23, no. 6, 1954 p 766-780
(Contract NASw-2485)
(NASA-TT-F-15777) Avail: NTIS HC $4.50 CSCL 07D

Results are reviewed which were obtained in the polarography of molten salts utilizing ternary electrolytes rather than the liquid capillary electrodes used by Steinberg and Nachtreib, and showing mathematical models consistenly predicting outcomes which can be proven empirically. Author

N74-32578*# Oak Ridge National Lab., Tenn. Chemistry Div.
INTERACTION OF GASES WITH LUNAR MATERIALS Progress Report
H. F. Holmes, E. L. Fuller, Jr., and R. B. Gammage 30 Jun. 1974 64 p refs
(NASA Order T-9380-A)
(NASA-CR-140194) Avail: NTIS HC $6.25 CSCL 08M

Quantitative efforts to assess the surface properties of lunar fines, particularly water induced porosity are discussed. Data show that: (1) changes induced in lunar fines are not visible in high energy electron micrographs, (2) scanning micrographs show no change in particle size distribution as a result of reaction with water, (3) water induced changes are internal to the particles themselves, (4) normal laboratory atmosphere blocks alteration

reaction with water, and (5) surface properties of mature lunar soils appear to be almost independent of chemical composition and mineralogy, but there are some variations in their reactivity toward water. Author

N74-32579*# Linguistic Systems, Inc., Cambridge, Mass.
THERMODYNAMIC CHARACTERISTICS OF THE HO2 RADICAL IN AN AQUEOUS SOLUTION
V. M. Berdnikov and O. S. Zhuraleva Washington NASA Aug. 1974 20 p refs Transl. into ENGLISH from Zh. Fiz. Khim. (USSR), v. 46, no. 10, 1972 p 2658-2661
(Contract NASw-2482)
(NASA-TT-F-15793) Avail: NTIS HC $4.00 CSCL 07D

An evaluation of the thermodynamic characteristics of the hydration and dissociation of HO2 is presented. Author

N74-32580*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HYDROCARBONS IDENTIFIED IN EXTRACTS FROM ESTUARINE WATER ACCOMMODATED NO. 2 FUEL OIL BY GAS CHROMATOGRAPHY-MASS SPECTROMETRY
Beverley W. Lewis, Ann L. Walker, and Rudolf H. Bieri (Virginia Inst. of Marine Science) 4 Sep. 1974 12 p
(NASA-TM-X-72009) Avail: NTIS HC $3.00 CSCL 07D

Results are presented on a computerized gas chromatograph-mass spectrometer analysis of methylene chloride and n-heptane extracts of a No. 2 fuel oil accommodated estuarine water sample. The analytical method is briefly described, and the limitations on the identifications are categorized. Some attempt was made to determine major and trace constituents in the water accommodate. Altogether 66 hydrocarbon compounds were identified specifically, and 75 compounds were partially identified. Seven compounds could be recognized as major constituents of the water accommodated oil and ten were present only as traces. The aromatic compounds found were alkyl benzenes, naphthalene, tetralin, indane, biphenyl, fluorene, anthracene, and some of their alkyl substituted isomers in the range of carbon numbers C7 to C15. Four n-alkanes, C10 to C13, were found along with four other assorted hydrocarbons. Author

N74-32581*# Kanner (Leo) Associates, Redwood City, Calif.
DETERMINATION OF NONVOLATILE CARBOXYLIC ACIDS IN NATURAL WATERS
I. A. Goncharova, A. N. Khomenko, and A. D. Semenov Washington NASA Sep. 1974 11 p refs Transl. into ENGLISH from Gidrokhim Mater. (USSR), v. 41, 1966 p 116-120
(Contract NASw-2481)
(NASA-TT-F-15942) Avail: NTIS HC $4.00 CSCL 07D

The sample, 0.51 H2O, made alkaline to pH 8-9, was evaporated to dryness and dried at 60 deg; the residue was dissolved in 1:1 HCl and extracted two times with 50 ml ether. The ether extract was neutralized with 0.01 N NaOH, the ether was removed, and the aqueous phase was evaporated to a l ml volume, acidified with H2S04, and passed through a column filled with Sio2. The acids were separated into four factions (a,b,c,d) by subsequent elution with 5, 10, 20, and 30 percent BuOH in CHCl3 and each fraction was separated by paper chromatography; the solvent was 7:3 PhOH-1 percent HCO2H (fractions a and b) and 18:2:9 BuOH-1 percent HCO2H-H2O (fractions c and d). The spots were located by spraying with 0.04 percent alcoholic bromocresol green. The fractions consist of: (a) pyruvic, funaric, glutaric, and adipic; (b) succinic and lactic; (c) oxalic and gallic; and (d) citric acids. Author

N74-32582# Pittsburgh Univ., Pa. Dept. of Chemistry.
MICROWAVE-OPTICAL DOUBLE RESONANCE SPECTROSCOPY Progress Report, 1 Feb. 1973 - 31 Jan. 1974
D. W. Pratt 1 Nov. 1973 25 p refs
(Contract AT(11-1)-3435)
(COO-3435-15) Avail: NTIS HC $3.25

Significant advances in the application of microwave optical double resonance techniques to the study of the structural properties of the phosphorescent triplet states of organic molecules were made. Results are reported for a variety of prototype triplet states including 1,4-dihalobenzenes, 1,2,4,5-tetrahalobenzenes, naphthalene and its halogenated derivatives, and benzophenone and several of its derivatives. In addition, measurements of the magnetic field dependence of the phosphorescence lifetimes of 1,2,4,5-tetrahalobenzenes in durene are reported, and it is shown how this information can be used to determine the field dependence of electron spin lattice relaxation times in the absence of microwaves. The adamantane matrix technique has been used for preparing a wide variety of free radicals and for obtaining their EPR, optical absorption and emission spectra. Author (NSA)

N74-32583# Ecole Nationale Superieure de Techniques Avancees, Paris (France).
PARAXYLENE CRYSTALLIZATION COMPUTATION OF KINETICS [CALCUL DE LA CINETIQUE DE CRISTALLISATION DU PARAXYLENE]
J. C. Noisier 1973 29 p refs In FRENCH
(Rept-024) Avail: NTIS HC $4.50

A theoretical study of the kinetics of paraxylene extraction by counterflow crystallization is presented. The mechanisms discussed are the mass and heat transfer liquidus/solidus which appear when a paraxylene sphere grows or shrinks when immersed in a stagnant solution of paraxylene-metaxylene. Starting from the quasi-stationary regime hypothesis the nonlinear partial derivative equations were solved by computing the material flux at interface using the Laplace transform and integrating numerically the first order equation that links this flux to the velocity of the interface. Also using an integral method generalized to the case of three transfers, the growth kinetics in a stationary regime was calculated together with the difference with the velocity obtained in the case of low subsaturation. Computerized solution of the implicit differential equations makes possible the comparison of the kinetics thus obtained with the quasi-stationarity hypothesis. ESRO

N74-32584# Esso Research and Engineering Co., Linden, N.J.
A REGENERATIVE LIMESTONE PROCESS FOR FLUIDIZED-BED COAL COMBUSTION AND DESULFURIZATION Final Report
R. C. Hoke, M. S. Nutkis, L. A. Ruth, and H. Shaw Jan. 1974 110 p refs
(Contract CPA-70-19)
(PB-231374/0; GRUS-14GFGS-74; EPA-650/2-74-001) Avail: NTIS HC $8.50 CSCL 07A

The report gives results of an experimental study of the pressurized combustion of coal in a fluidized bed of limestone and regeneration of sulfated limestone. The study is part of a program to develop fluidized-bed coal combustion as a means of desulfurizing flue gas in-situ and generating clean power at low cost. The process, including regeneration of spent limestone by reduction to lime, produces a gas stream containing a sufficient concentration of SO2 to be fed to a by-product sulfur recovery unit. Initial SO2 removal rates were about 85%. The regeneration step was studied at pressures up to 10 atm and temperatures up to 2100F. High conversion of sulfated material to lime was achieved by injecting air into the bed, by forming adjacent reducing and oxidizing zones, and by minimizing formation of undesired CaS. GRA

N74-32585# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
ABSORPTION OF SO2 INTO LIME SLURRIES: ABSORPTION RATES AND KINETICS Final Report
Edward Vivian Dec. 1973 62 p refs
(Contract EPA-68-02-0018)
(PB-230936/7; EPA-650/2-73-047) Avail: NTIS HC $6.25 CSCL 07D

Results are given of a study of the absorption of SO2 from ans SO2/N2 gas mixture into water and lime solutions and slurries (in a short wetted wall column at approximately 1 atmosphere and 25C). The mole per cent of SO2 in the gas was varied from 0.03 to 0.37. In solutions of calcium hydroxide greater than 0.01 g mole/liter and in slurries, the system appeared to be gas absorption accompanied by an infinitely rapid irreversible second-order reaction in the liquid phase. The only effect of the solid in the slurries was to increase the absorption capacity. In water, the system appeared to be gas absorption accompanied by a fast reversible hydrolysis reaction in the liquid phase. The major resistance to gas absorption at these concentration levels was found to be in the gas phase. At the lowest concentrations studied, the system was gas-phase controlled. GRA

N74-32586# Abcor, Inc., Cambridge, Mass. Walden Research Div.
METHODS FOR THE RAPID AND ACCURATE MEASUREMENT OF NITRATE AND SULFATE IN ATMOSPHERIC PARTICULATES
D. Williams, J. Driscoll, C. Curtin, and R. Hebert Dec. 1973 105 p refs
(Contract EPA-68-02-0564)
(PB-230887/2; EPA-650-2-73-050) Avail: NTIS HC $8.25 CSCL 07D

Spectrometric methods for nitrate and sulfate measurement are presented. An Orion nitrate electrode is used to measure nitrate leached from high volume filter samples. A sulfate procedure was developed using a lead precipitation technique and measuring the excess lead ion with an Orion lead electrode. Increased sensitivity was obtained by adding an equal volume of methyl cellosolve acetate (MCA) to the high volume extracts. Studies on leaching the sulfate or nitrate from the high volume filter samples were performed. The techniques and results are reported. GRA

N74-32587# Pittsburgh Univ., Pa. Dept. of Physics.
ATOMIC COLLISIONS AND PLASMA PHYSICS Final Report, 16 Dec. 1969 - 15 Dec. 1972
Manfred A. Biondi 24 May 1974 6 p refs
(Grant DA-ARO(D)-31-124-70-G34)
(AD-780970; AROD-3187-16-P) Avail: NTIS CSCL 07/4

Research results concerning atmospheric ion reactions are briefly summarized. Measurements of the coefficients of recombination of electrons with positive ions of the H3O(+).(H2O)n series have been carried out. Clustering of NO(+) ions to N2 and to H2O has been studied to clarify the cluster-switching sequence responsible for D-region production of H3O(+).(H2O)n series ions. Reaction rates of O(+) with N2 and O2 to form NO(+) and O2(+) at high ion temperatures (F-region conditions) have been determined. Ionization and electron heating by metastable atoms have been studied in very pure helium afterglows. (Modified author abstract) GRA

N74-32588# Stanford Research Inst., Menlo Park, Calif.
MULTIPHOTON DETACHMENT OF NEGATIVE IONS
N. M. Kroll and K. M. Watson Mar. 1974 34 p refs
(Contract DAHC15-73-C-0370; SRI Proj. 3000)
(AD-779887; SRI-JSR-73-6) Avail: NTIS CSCL 07/5

A theory is presented to describe multiphoton detachment of negative ions by intense laser beams. The detachment rate is expressed in terms of the single-photon detachment rate. Numerical results are presented for detachment of electrons from O(-) and O2(-). Critical comments are given concerning some theories of multiphoton ionization. Author (GRA)

N74-32589# Princeton Univ., N.J.
ZERO-FIELD PARAMAGNETIC RESONANCE OF TRIVALENT GODOLINIUM IN SEVERAL LANTHANON TRIS (ETHYLSULFATE) NONAHYDRATES AND NONADEUTERATES: DETERMINATION OF CRYSTAL FIELD AND HYPERFINE STRUCTURE PARAMETERS Technical Report, 1 Jun. - 30 Nov. 1974
E. R. Bernstein and G. M. Dobbs 1 Jun. 1974 82 p refs
(Contract N00014-67-A-0151-0032; NR Proj. 056-528)
(AD-779872; TR-6) Avail: NTIS CSCL 07/4

Employing isotopically pure trivalent 155Gd, 157Gd, and 160Gd as guests in dilute mixed crystals of lanthanum tris (ethylsulfate) nonahydrate La3(C2H5SO4)3.9H2O, it has been possible to determine both accurate zero-field splitting parameters of crystal field origin and hyperfine structure constants due to magnetic dipole and electric quadrupole interaction terms. The zero-field paramagnetic resonance spectroscopic method is used. It is reasoned that the quadrupole hyperfine constant is due, almost entirely, to lattice contributions; moreover, it is shown to be of the expected order of magnitude and sign. The hyperfine anomaly is discussed. A set of crystal field parameters are reported for the first time for 160Gd in crystals of La(C2H5SC4)3.9D2O which differ significantly from those of the hydrate. Variations of crystal field parameters with various lanthanon host ions are also observed. Finally, a few comments concerning zero-field line widths and their measurement are made. (Modified author abstract) GRA

N74-32590# Battelle Columbus Labs., Ohio.
DEVELOPMENT OF GASEOUS MEDIA FOR SEF (SEQUENTIAL EXCITATION OF FLUORESCENCE) 3-DIMENSIONAL DISPLAYS Annual Report, 22 Jan. 1973 - 28 Feb. 1974
R. H. Barnes, C. E. Moeller, J. F. Kircher, and C. M. Verber Jun. 1974 17 p refs
(Contract N00014-73-C-0254; NR Proj. 215-217)
(AD-780955) Avail: NTIS CSCL 07/4

The report covers the first year's effort related to the development of gaseous display media for three-dimensional display systems based on two-step excitation of fluorescence. The main emphasis was devoted to investigations involving the diatomic halogens I2 and ICl, and two-step excitation of fluorescence was demonstrated in ICl. Details regarding the continuing studies are discussed. Author (GRA)

N74-32591# Aerospace Corp., El Segundo, Calif. Lab Operations.
KINETICS OF THE REACTION BETWEEN Fe (II) AND Ag (I) CATALYZED BY SILVER NUCLEI ON Ti O2 SURFACES Interim Report
Paul D. Fleischauer and John R. Shepherd 25 Apr. 1974 42 p refs
(Contract F04701-73-C-0074)
(AD-779925; TR-0074(9270-02)-2; SAMSO-TR-74-116) Avail: NTIS CSCL 07/4

The one-electron reduction of Ag(I) by Fe(II) in aqueous solution is catalyzed by nuclei of silver metal on TiO2 single-crystal and thin-film surfaces. The reaction results in the selective precipitation of silver on the catalytic nuclei, forming spherically shaped silver particles that eventually grow together into a continuous film. The kinetics of the reaction show that adsorption of Ag(I) on the substrate TiO2 surface is an important step in the mechanism, the adsorption follows a Langmuir isotherm, and the rate-determining step of the reaction is the electron transfer from Fe(II) to adsorbed Ag(I). Results are presented for two types of catalytic nuclei on TiO2: that introduced by photochemical deposition of silver, and that formed by vapor deposition. Significant differences were observed in the kinetics of the reaction on the two types of silver surface. These differences indicate the need for caution in extending kinetics results for model systems to practical applications. Author (GRA)

N74-32592# Aerodyne Research, Inc., Burlington, Mass.
AN ANALYSIS OF THE VISIBLE CHEMILUMINESCENCE OBSERVED IN THE GAS-PHASE OXIDATION OF ALUMINUM AND ITS COMPOUNDS Final Technical Report, Jul. 1973 - Jan. 1974
C. E. Kolb, D. R. Herschbach, and M. E. Gersh Apr. 1974 45 p refs
(Contract F30602-73-C-0162; ARPA Order 1649)
(AD-780561; ARI-RR-44; RADC-TR-74-163) Avail: NTIS CSCL 07/4

A mechanism based on the population of and emission from the (A doublet Pi) and/or lowest-lying quartet sigma(+) and quartet Pi states of AlO is suggested as an explanation for the visible chemiluminescence often observed in the gas-phase oxidation of aluminum. Data from upper atmospheric chemical release experiments utilizing aluminized grenades, aluminized burners, and trimethylaluminum are examined, and AlO(*) pumping steps based on the reaction of molecules containing loosely bound aluminum atoms with atomic oxygen are suggested. Previously proposed theories are shown to be unable to reproduce reasonably the observed data. The results of selected, recent laboratory experiments involving chemiluminescent reactions of metal atoms and dimers with electrophilic atoms and molecules are discussed in terms of the proposed mechanism. Several possible experiments to test the proposed mechanism are suggested. Author (GRA)

N74-32593# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
CONTINUOUS VAPORIZATION OF LIQUID FLUORINE DURING TEST OPERATIONS Final Report, Sep. 1969 - Mar. 1974
Steven A. Bluhm May 1974 9 p
(AD-780926; AFRPL-TR-74-18) Avail: NTIS CSCL 07/4

A liquid fluorine system capable of continuous vaporization was designed and installed at the AFRPL to support continuous

wave chemical laser experiments. Using a modified commercial vaporizer, the system vaporized liquid fluorine during eight chemical laser tests with no malfunctions. The nominal operating parameters were 550 psig, 40 grams/sec, and 20 minutes duration. Based upon experience with this system, liquid fluorine can be vaporized continuously in a safe, efficient and environmentally-sound manner. Author (GRA)

N74-32594# Purdue Univ., Lafayette, Ind. Project Squid Headquarters.
SYMMETRY BREAKING INSTABILITIES IN ILLUMINATED SYSTEMS
Abraham Nitzan, Peter Ortoleva, and John Ross Jan. 1974 57 p refs Prepared in cooperation with MIT, Cambridge
(Contract N00014-67-A-0226-0005; NR Proj. 098-038; Proj. Squid)
(AD-780916; SQUID-TR-MIT-79-PU) Avail: NTIS CSCL 07/4

Chemically non-reactive and reactive systems (closed and homogeneous) are shown to become unstable to inhomogeneous perturbations beyond given critical intensities of uniform illumination, so that macroscopic inhomogeneities, spatial patterns, arise. The authors classify symmetry-breaking instabilities into two types, one in which the characteristic length of the developing spatial pattern is determined by the dimensions of the system, and the other in which that characteristic length is determined by the dynamics of the system (reaction rates and transport relations). A variety of non-linear systems are analyzed by means of a linear stability analysis, including an illuminated, isothermal, isobaric, two species system, and a two-component non-reactive illuminated gaseous system in which diffusion, thermal conduction and thermal diffusion may occur. Pressure fluctuations are considered in an analysis of a one-component system under steady illumination at a wavelength which is absorbed by the molecules and then converted into heat. Such a system may generate and amplify sound waves. (Modified author abstract) GRA

N74-32595# Physical Sciences, Inc., Wakefield, Mass.
ANALYTIC SOLUTIONS FOR INITIATION OF PLASMA ABSORPTION ABOVE LASER: IRRADIATED SURFACES LASER EFFECTS CALCULATIONS Quarterly Report, Feb. - Jun. 1974
Anthony N. Pirri 31 May 1974 50 p refs
(Contract N00014-74-C-0207)
(AD-781738; PSI-TR-8) Avail: NTIS CSCL 07/4

A program to obtain analytic solutions for the effects of vapor and air absorption, and the subsequent onset of plasma shielding, on the radiation that impinges upon a laser-irradiated surface has been initiated. The problem addressed in this report is the determination of the time scale for ignition of a laser supported absorption wave as a function of laser intensity, material, spot size and wavelength. It is shown that over a range of intensities the vapor properties up to the time for ignition can be calculated by uncoupling the heating from the gas dynamics. The time history of the heating effects is obtained by doing a perturbation upon the flow field. The flow is either one-dimensional planar or two-dimensional axisymmetric depending upon the ratio of an appropriate absorption time scale to a characteristic flow time. (Modified author abstract) GRA

N74-32596# AeroChem Research Labs., Inc., Princeton, N.J.
ALUMINUM OXIDE KINETICS Semiannual Technical Report, 25 Jun. 1973 - 28 Feb. 1974
Arthur Fontijn and William Felder May 1974 23 p refs
(Contract F30602-73-C-0339; ARPA Order 1649; AF Proj. 1649)
(AD-780560; AeroChem-TP-307; RADC-TR-74-158) Avail: NTIS CSCL 07/4

The present work provides kinetic information on Al oxide reactions. To measure such kinetics the authors have modified the AeroChem high-temperature fast-flow reactor to allow direct observation of AlO by laser induced resonance fluorescence. They report here on the experimental methods and on their first observations on the reaction AlO + O2 to AlO2 + O. Rate coefficients are obtained from the observed variations in the relative AlO concentration as a function of reaction time, (O2) and total pressure at each of several temperatures. GRA

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N74-32597 British Broadcasting Corp., Kingswood (England). Research Dept.
REDUCTION OF CROSS-COLOUR EFFECTS IN PAL (SYSTEM 1) COLOUR TELEVISION BY THE USE OF LOW-PASS AND NOTCH FILTERS: SUBJECTIVE TESTS
S. J. Lent and C. R. G. Reed Jul. 1974 9 p refs
(BBC-RD-1974/25) Avail: BBC, Kingswood Warren, Tadworth, Surrey, Engl.

Luminance components of a PAL color television signal that lie within the frequency band occupied by the chrominance subcarrier and its sidebands are liable to produce cross color effects on the displayed color picture. To mitigate these effects the response/frequency characteristic of the luminance channel of a four tube color television camera was modified by including, in turn, a wide notch filter, a narrow notch filter and a 3.6 MHz low pass filter. The results of subjective tests of the effects of these filters on the resolutions cross color and color spreading of a PAL color picture are presented. The tests were carried out for two values of decoder chrominance channel bandwidth. The resolution of the compatible monochrome picture was also examined. The results indicate that the inclusion of a 3.6 MHz low pass filter in the camera luminance channel provides a substantial reduction of cross color with little loss of resolution. The narrower bandwidth chrominance decoder provided a useful reduction in cross color with little apparent loss of chrominance resolution. Author

N74-32598* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METHOD AND APPARATUS FOR DECODING COMPATIBLE CONVOLUTIONAL CODES Patent
George D. Doland, inventor (to NASA) (Lockheed Electron. Co., Houston, Tex.) Issued 20 Aug. 1974 9 p Filed 28 Jun. 1972 Supersedes N72-27178 (10 - 18, p 2395) Sponsored by NASA
(NASA-Case-MSC-14070-1; US-Patent-3,831,142; US-Patent-Appl-SN-266940; US-Patent-Class-340-146.1AQ) Avail: US Patent Office CSCL 17B

This invention relates to learning decoders for decoding compatible convolutional codes. The decoder decodes signals which have been encoded by a convolutional coder and allows performance near the theoretical limit of performance for coded data systems. The decoder includes a sub-bit shift register wherein the received sub-bits are entered after regeneration and shifted in synchronization with a clock signal recovered from the received sub-bit stream. The received sub-bits are processed by a sub-bit decision circuit, entered into a sub-bit shift register, decoded by a decision circuit, entered into a data shift register, and updated to reduce data errors. The bit decision circuit utilizes stored sub-bits and stored data bits to determine subsequent data-bits. Data errors are reduced by using at least one up-date circuit. Official Gazette of the U.S. Patent Office

N74-32599 AEG-Telefunken, Backnang (West Germany).
TELEVISION BROADCASTING SATELLITE PROJECT. FEASIBILITY ANALYSIS PHASE A. VOLUME 1: SUMMARY [PROJEKT FERNSEHRUNDFUNKSATELLIT. DURCHFUEHRBARKEITSANALYSE PHASE A. ABSCHLUSSBERICHT BAND 1: ZUSAMMENFASSUNG]
[1973] 45 p In GERMAN
(Contract RV-2/1-V-15/72-QH-01-00)
Copyright. Avail: Issuing Activity

The results of a feasibility study for a German TV broadcasting satellite are summarized. Coverage zones envisaged are either Germany or German-speaking European countries. The satellite configuration and mission profile are detailed, as well as the transmission system including the ground stations and home receivers. ESRO

N74-32600# Joint Publications Research Service, Arlington, Va.
ABSTRACTS OF 1974 ALL UNION RADIO DAY SCIENTIFIC MEETING
9 Aug. 1974 94 p refs Transl. into ENGLISH of the book "Vsesoyuznaya Nauchnaya Sessiya, Posvyashchennaya Dnyu Radio, Annotatsii I Tezisy Dokladov" Moscow, Izd-vo Sovetskoye Radio, 18 Mar. 1974 p 1-64
(JPRS-62686) Avail: NTIS HC $7.75

Annotations and topics of reports on radiobroadcasting, electroacoustics and sound recording, radio receivers and amplifiers, and antennas are presented. Author

N74-32601*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FIELD SEQUENTIAL STEREO TELEVISION Patent Application
William E. Perry, inventor (to NASA) Filed 31 Jul. 1974 24 p
(NASA-Case-MSC-12616-1; US-Patent-Appl-SN-493360) Avail: NTIS HC $4.25 CSCL 09F

A stereoscopic image reproduction system for providing, in rapid sequence, alternating right and left stereoscopic images of an object and presenting such images on the same display device is disclosed. The user observes images on the display device through a solid state electro-optic shuttering device synchronized to the alternating stereoscopic images to permit light transmission to the right eye only when the right stereo image is on the display device and to the left eye only when the left stereo image is on the display device. A particular embodiment disclosed employs a two-camera television system with a field sequential multiplexer to provide the alternating images on a television screen. Another television embodiment uses a second solid state electro-optic shuttering device in conjunction with a single camera and range finder type optics to provide the alternating image signal. NASA

N74-32602# National Aviation Facilities Experimental Center, Atlantic City, N.J.
X-BAND TERMINAL RADAR TEST AND EVALUATION Final Report, Jan. - Feb. 1973
Ronald S. Bassford Jan. 1974 72 p
(FAA Proj. 021-241-050)
(AD-774677; FAA-NA-73-59; FAA-RD-73-159) Avail: NTIS HC $3.75

An X-band radar system was evaluated to determine its capability to perform as an airport surveillance radar. Included in the investigation were equipment tests to determine basic system parameters, flight tests to determine system coverage with respect to air traffic control requirements, tests to determine the capabilities of the system processor, and an operational evaluation performed by Van Nuys, California Air Traffic Control personnel. Author

N74-32603# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
ANGEL CLUTTER AND THE ASR AIR TRAFFIC CONTROL RADAR. VOLUME 2: APPENDICES Final Report, Oct. 1971 - Feb. 1973
J. R. Barry, B. K. Carter, R. J. Erdahl, R. L. Harris, J. T. Miller, G. D. Smith, and R. M. Barnes Feb. 1973 258 p refs 2 Vol.
(Contract DOT-FA72WA-2705)
(AD-775306; MSO-F-195; FAA-RD-73-158-Vol-2) Avail: NTIS HC $6.50

The goal of this study was to identify angel clutter reduction techniques which were cost-effective for the existing ASR-4,5, and 6 radars. A combination of techniques is identified which can be implemented without major radar redesign and which improves the ASR surveillance capability. These techniques were developed by thorough analysis of ASR video and track radar data gathered during the Spring 1972 bird migrations at Milwaukee's General Mitchell airport. The proposed angel clutter reduction (ACR) features operate on the three major differences observed between angel and aircraft signal characteristics: signal strength, pulse-to-pulse amplitude fluctuations, and velocity. These ACR features were chosen because they provide the highest level of effectiveness consistent with timely implementation and a reasonable degree of radar modification. Author

N74-32604*# Techtran Corp., Glen Burnie, Md.
TELEMETRY FORMAT SYNCHRONIZER AND DECOMMUTATOR IN THE UNIFIED TELEMETRY SYSTEM GROUND STATION
V. V. Lavrusevich Washington NASA Jul. 1974 11 p refs Transl. into ENGLISH of "Sinkhronizator Telemetricheskogo Formata i Dekommutator v Nazemnoy Stantsii Etms" Moscow, Acad. of Sci. USSR, report Pr-177, 1974 15 p
(Contract NASw-2485)
(NASA-TT-F-15669) Avail: NTIS HC $4.00 CSCL 09F

Probability values for missing the frame interval are analyzed, as well as the detection of false frame intervals for various signal to noise ratios. The sequence of operation of the format synchronizer is also examined. Author

N74-32605*# Kanner (Leo) Associates, Redwood City, Calif.
RADIO WAVE PROPAGATION IN THE SOLAR SYSTEM
O. I. Yakovlev Washington NASA Aug. 1974 181 p refs Transl. into ENGLISH of the book "Rasprostraneniye Radiovoln v Solnechnoy Sisteme" Moscow, Sovetskoye Radio Press, 1974 192 p
(Contract NASw-2481)
(NASA-TT-F-15723) Avail: NTIS HC $12.25 CSCL 20N

The principles of propagation of radio waves emitted by spacecraft moving in the solar system and radio wave reflections by the surfaces of the Moon, Mars and Mercury are examined. Distinctive features of radio wave propagation in the atmospheres and ionospheres of Mars, Venus, and Jupiter, and in the interplanetary and circumsolar plasmas are described. Radio occultation methods of investigating the solar corona and the planetary atmospheres are included, as are radio wave reflection methods for studying the surfaces of the moon and planets. Author

N74-32606*# Kanner (Leo) Associates, Redwood City, Calif.
SPACE TELEVISION: QUESTIONS OF THEORY AND PRACTICE OF SPACE TELEVISION SYSTEM DESIGN
P. F. Bratslavets, I. A. Rosselevich, and L. I. Khromov Washington NASA Sep. 1974 251 p refs Transl. into ENGLISH of the book "Kosmicheskoye Televideniye" Moscow, Svyaz, 1973 p 1-248
(Contract NASw-2481)
(NASA-TT-F-15776) Avail: NTIS HC $15.75 CSCL 09F

Information is given on television for space research, including definitions, fields of use and classification of space television systems, structural diagrams, video signal formation, amplitude-frequency characteristics, system feasibility conditions, television parameter selection, and the effect of linear and noise characteristics on image quality. Fundamentals of television theory are presented, including general information, discrete and continuous communication systems, receivers, including theory of continuous reception, potential resolution, and the optimum television camera. Slow-scan transmission of television data from space is presented, including television signal spectrum compression memory length, camera tube storage, slow-scan video signal formation, television camera light sensitivity, camera tube target erasure, storage and counting in field control mode, video preamplifier, and viedo signal processing in the intermediate video amplifier. The light television, narrow-band mechanical, narrow-band electronic, and wide-band electronic systems are also discussed. Author

N74-32607*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
HIGH TEMPERATURE ANTENNA DEVELOPMENT FOR SPACE SHUTTLE, VOLUME 2 Final Report
E. A. Kuhlman 30 Apr. 1974 180 p refs
(Contract NAS9-13004)
(NASA-CR-140226; MDC-E0896-Vol-2) Avail: NTIS HC $12.00 CSCL 17B

An S-band antenna system and a group of off-the-shelf aircraft antenna were exposed to temperatures simulating shuttle orbital cold soak and entry heating. Radiation pattern and impedance measurements before and after exposure to the thermal environments were used to evaluate the electrical performance. The results of the electrical and thermal testing are given. Test

data showed minor changes in electrical performance and established the capability of these antenna to withstand both the low temperatures of space flight and the high temperatures of entry. Author

N74-32608*# Washington Univ., St. Louis, Mo. Center for Development Technology.
DESIGN OF A 12 CHANNEL fm MICROWAVE RECEIVER
Craig O. Risch, Fred J. Rosenbaum, and Robert O. Gregory Jul. 1974 166 p refs
(Grant NGR-26-008-054)
(NASA-CR-140056; R(T)-74/2) Avail: NTIS HC $11.50 CSCL 17B

The design, fabrication, and performance of elements of a low cost FM microwave satellite ground station receiver is described. It is capable of accepting 12 contiguous color television equivalent bandwidth channels in the 11.72 to 12.2 GHz band. Each channel is 40 MHz wide and incorporates a 4 MHz guard band. The modulation format is wideband FM and the channels are frequency division multiplexed. Twelve independent CATV compatible baseband outputs are provided. The overall system specifications are first discussed, then consideration is given to the receiver subsystems and the signal branching network. Author

N74-32609# Los Alamos Scientific Lab., N.Mex.
COMPUTER GENERATED MOVIES: ANOTHER DIMENSION IN MAN-MACHINE COMMUNICATIONS
R. L. Elliott, S. R. Orr, and E. C. Pequette [1974] 3 p Presented at 2d AEC Sci. Computer Inform. Exchange Meeting, New York, 2 May 1974
(LA-UR-74-500; Conf-740512-1) Avail: NTIS HC $4.00

A typical hydrodynamic physics program may run up to 20 hours on a CDC 7600 computer and generate up to a billion numbers. The biggest problem facing the users of these programs is simply comprehending what has been calculated. Stacks of computer listings are typical outputs but serve as a poor communication medium. Static pictures are much better than listings but are limited to two dimensions. Through the use of movies, one adds a third dimension to the communication process. The evolution of computer generated movies and the techniques now in use are described. Author (NSA)

N74-32610# Posterijen, Telegrafie en Telefonie, The Hague (Netherlands). Dr. Neher Lab.
INTERFACE SYSTEM KNMI [INTERFACE-SYSTEEM KNMI]
G. J. A. Langelaan Mar. 1972 22 p In DUTCH
(SL-284) Avail: NTIS HC $4.25

An interface enabling the PDP 8/E computer of Royal Dutch Meteorological Institute, de Bilt, Netherlands, to process meteorological data transmitted by the Geatrans 1100 apparatus located at the light island, Goeree, was developed. Skip, interrupt, input, and printer control are discussed. The computer program for testing the interface is listed. ESRO

N74-32611# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE BULK FILTERING, ACQUISITION, AND TRACKING SYSTEM (BATS)
Carl M. Steinmetz 2 Oct. 1973 123 p refs
(Contract F19628-73-C-0002; DA Proj. 7X2-33304-D-215)
(AD-781101; TR-510; ESD-TR-73-250) Avail: NTIS CSCL 17/9

In the report, bulk filtering refers to simultaneous measurement of the velocity of all objects in a radar beam, and the automatic rejection of those with a velocity less than some specified amount. The Bulk filtering, Acquisition, and Tracking System (BATS) is a signal processor used with the TRADEX radar for experiments in the bulk filtering of ballistic-missile tank fragments. BATS is a part of the Designation and Discrimination Engineering Program which studies ABM radar system functions crucial to the design of future ABM systems. A detailed description of the signal--processing equipment designed and constructed for this program is presented. Author (GRA)

N74-32612# Raytheon Co., Wayland, Mass. Advanced Development Lab.
EHF DIGITAL RADIO SET AN/GRC-173(XW-1) Final Technical Report
Richard F. Hazel, Frederick L. Hills, and John Orecchio Feb. 1974 183 p refs
(Contract F30602-70-C-0063)
(AD-781109; RADC-TR-74-10) Avail: NTIS CSCL 17/2

The report presents the design philosophy, system and unit descriptions and the test results achieved for the AN/GRC-173 (XW-1) digital Radio Set. The system consists of a Digital Group, Radio Group and Orderwire Group colocated within a modified S-141 shelter, and an Antenna Group mounted externally to the shelter. The Digital Group performs the function of interfacing with a mixture of digital data sources such as secure digitized TV, videophone, TDM equipment such as the Multiplexer Set AN/GSC-24(V), and produces a high-speed (235.93 MB/S) digital data stream for transmission and reception by the Radio Group and Antenna Group as DPSK modulated signals in the 36.0 to 38.6 GHz frequency band. Detailed functional descriptions of the units comprising the Digital Group and Radio Group as well as the individual circuit cards and components are presented. (Modified author abstract) GRA

N74-32613# ITT Gilfillan, Inc., Van Nuys, Calif.
DIGITAL MOVING TARGET INDICATOR MEASUREMENTS PROGRAM Final Report
John F. Chaney Mar. 1974 130 p refs
(Contract F30602-73-C-0338)
(AD-780549; ITTG-4069-F; RADC-TR-74-35) Avail: NTIS CSCL 17/9

The results of a DMTI (Digital Moving Target Indicator) measurements program are reported. In this program the performance of a variety of DMTI processors was measured and compared with theoretical performance predictions. Measurements were made of the MTI improvement factor and the subclutter visibility for the case of radar set operation in a severe ground clutter environment with IF limiting of the clutter signals. Some MTI improvement factor measurements were also made for the linear system case. The effect of MTI processing on target detectability for the case of a target-in-the-clear was also measured. Some MTI performance data for the case of rain clutter was also obtained. (Modified author abstract) GRA

N74-32614# Lincoln Lab., Mass. Inst. of Tech., Lexington.
COMPENSATION OF MULTIPATH ANGULAR TRACKING ERRORS IN RADAR
Israel Kupiec 20 Mar. 1974 36 p refs
(Contract F19628-73-C-0002; DA Proj. 7X2-63304-D-215)
(AD-781100; TR-501; ESD-TR-74-138) Avail: NTIS CSCL 17/9

Multipath compensation techniques for radar applications are being evaluated. Three methods which comprise an extension of the conventional monopulse and a fourth that uses coherent samples taken across the antenna aperture were considered. The performance in the presence of a single specular reflection from the ground is compared by means of Monte Carlo computer simulations. The aperture sampling technique using a minimizing search processing is found to outperform the other methods. Author (GRA)

N74-32615# Federal Communications Commission, Washington, D.C. Research Div.
PRECIPITATION SCATTER INTERFERENCE COMPUTATION
Harry Fine 1 Sep. 1973 93 p refs
(PB-230989/6; R-7303) Avail: NTIS HC $7.75 CSCL 17B

Existing CCIR documentation is supplemented on precipitation scatter interference, giving more details on assumptions and development of formulas for such interference. Techniques are developed for determining the location of maximum scattering volumes and computing the maximum permissible interference into the system to be protected. Vector and matrix methods are developed for computing the geometric parameters required for the computation of precipitation scattering interference. Author (GRA)

N74-32616# Army Land Warfare Lab., Aberdeen Proving Ground, Md.
AIRBORNE TV SYSTEM Final Report
Curtis L. Paxton May 1974 12 p refs

(AD-780729; LWL-TR-74-63) Avail: NTIS CSCL 17/2

The report describes the development and test of 10 and 100 watt television transmission systems carried by helicopter. The purpose of the project was to determine whether the system meets the support-mission requirements of PSYOP warfare, and whether it can provide communications in the event of civil disaster. Transmission of both color and black-white programming material was successfully demonstrated. Test results also indicate that the 6-mile radius of ground coverage satisfied the range requirements associated with civil disaster activity.

Author (GRA)

N74-32617# Naval Undersea Center, San Diego, Calif.
IMAGE TRANSMISSION VIA SPREAD SPECTRUM TECHNIQUES Quarterly Technical Report, 1 Oct. 1973 - 1 Jan. 1974
Robert W. Means, Jeffrey M. Speiser, and Harper J. Whitehouse 30 Jun. 1974 89 p refs
(ARPA Order 2303)
(AD-780805; QTR-3) Avail: NTIS CSCL 17/2

The paper addresses the design of a spread spectrum image transmission system to provide increased antijam protection to a television link from a small remotely piloted vehicle. Transform encoding and frame rate control may be used to remove the natural redundancy inherent in the image in order to permit the use of spread spectrum encoding for increased antijam protection. Emphasis is placed on the two-dimensional discrete cosine transform (DCT) and a hybrid DCT with differential pulse code modulation (DPCM). Both the two-dimensional DCT and the hybrid DCT/DPCM provide nearly the theoretically optimal performance of the Karhunen-Loeve transform, while permitting implementation by small, lightweight hardware in real-time.

Author (GRA)

N74-32618# Aerospace Corp., El Segundo, Calif.
DIGITAL COMMUNICATION OVER ARBITRARY ADDITIVE NOISE CHANNELS Technical Report, Nov. 1973 - Feb. 1974
Lloyd M. Nirenberg 15 Mar. 1974 48 p refs
(Contract F04701-73-C-0074)
(AD-781136; TR-0074(4901-02)-4; SAMSO-TR-74-141) Avail: NTIS CSCL 17/2

The report presents a simple formula for the capacity of a coherent digital communication channel operating near threshold (i.e., with very low signal-to-noise ratio (SNR) with additive noise of arbitrary probability distribution. For coherent signals in this threshold mode, a computationally feasible formula for the probability of error (P sub e) is given, along with a simple upper bound to (P sub e). For the noncoherent threshold channel, the optimum receiver is derived for arbitrary modulations and fading. This receiver is shown to specialize to previously derived canonical forms for unmodulated signals. Author (GRA)

N74-32619# Army Electronics Command, Fort Monmouth, N.J.
MILLIMETER WAVE COMMUNICATION STUDIES
Vahakn Nalbandian Jun. 1974 53 p refs
(DA Proj. 1S7-62701-AH-92)
(AD-780709; ECOM-4224) Avail: NTIS CSCL 17/2

A comprehensive review of different types of millimeter wave components was made. Different types of RF power sources are discussed and compared in detail. The design of a 15 GHz transmitter and receiver is covered. A detailed description of an in-house designed and fabricated DPSK modulator is presented. Finally, 5 km line-of-sight test results are given.

Author (GRA)

N74-32620# Syracuse Univ. Research Corp., N.Y.
LINE INTRUSION DETECTOR Final Report
E. K. Stodola May 1974 60 p refs
(Contract DAAD05-73-C-0782)
(AD-780719; SURC-TR-74-107; LWL-CR-06P73) Avail: NTIS CSCL 17/9

Several radiating line configurations were experimentally evaluated for use in a line-type intrusion detection system. The types of radiating lines examined were Radiax cable, Goubau line and television twin lead (300 ohm). Measurements of dissipative and radiation losses were made at 140 and 915 MHz and these data are presented, together with theoretical considerations related to a line intrusion detection system. Author (GRA)

N74-32621# Air Force Academy, Colo. Frank J. Seiler Research Lab.
EVALUATION OF AN ESTIMATOR FOR REAL-TIME MISSILE TRACKING Final Scientific Report, Oct. 1973 - Jun. 1974
Kenneth D. Herring Jun. 1974 50 p refs
(AF Proj. 7904)
(AD-780894; SRL-TR-74-009) Avail: NTIS CSCL 17/9

The report contains an abbreviated evaluation of a Kalman filter designed to estimate in real time the position and velocity of a missile. Most aspects of the evaluation are rather cursory. However, the evaluation of the Automatic Source Selection feature of the estimator received detailed attention. Due to computational constraints, the information from only one radar can be processed at each time instant. The Automatic Source Selection feature selects the best radar. The basic logic of the feature is sound; however, several recommendations for improvement are made. Included is a recommendation to use a weighted least squares combination of the individual radar Kalman filters. It is proven that the recommended least squares estimate will always be better than the single-radar Kalman filter estimate, even for the best estimate. Author (GRA)

N74-32622# Clemson Univ., S.C.
THE OBSERVATION OF BIRDS WITH WEATHER AND AIRPORT SURVEILLANCE RADARS Final Report 1 Oct. 1972 - 1 Feb. 1974
Sidney A. Gauthreaux, Jr. Apr. 1974 50 p refs
(Grant AF-AFOSR-1974-71; AF Proj. 2103)
(AD-780597; AFWL-TR-74-57) Avail: NTIS CSCL 17/9

The application of radar to detect, quantify, and monitor the movements of birds is emphasized. Of all the approaches currently being used to reduce the hazards that birds pose to aviation, radar techniques offer the promise of definite results. The distribution of surveillance radars at numerous locations throughout the United States, particularly in the vicinity of active airfields, adds greatly to the attractiveness of this approach. The review of radar techniques and bird migration information should greatly aid radar operators in recognizing the various types of echoes from birds displayed on weather and air traffic control radars, in estimating the numbers of birds passing overhead, and in gathering information on the altitude of the birds aloft. Use of these techniques should greatly benefit aviation interests, both civilian and military, by reducing the number of bird/aircraft collisions and improving flight safety. (Modified author abstract) GRA

N74-32623# RAND Corp., Santa Monica, Calif.
ATMOSPHERIC EFFECTS ON TERRESTRIAL MILLIMETER-WAVE COMMUNICATIONS
S. J. Dudzinsky, Jr. Mar. 1974 45 p refs
(Contract DAHC15-73-C-0181)
(AD-780602; R-1335-ARPA) Avail: NTIS CSCL 20/14

A methodology is given for quantitatively estimating the performance of millimeter-wave systems (30-300 GHz) in the atmosphere and in the presence of rainfall. Information on the transmission properties of millimeter waves is combined with currently available meteorological data to derive the methodology. The available propagation and rainfall data for a given climatic region are used to derive curves giving attenuation due to rainfall versus path length for various frequencies. Emphasis is on high-reliability communications in which outages are 0.1 percent (530 min of outage per year) or less, but the methodology described applies to higher outage systems as well.

Author (GRA)

N74-32624# Computer Sciences Corp., Falls Church, Va.
COMMUNICATIONS SUPPORT REQUIREMENTS (COMSR) STUDY, VOLUME 5, APPENDIX B, PART 1 Final Report, Nov. 1972 - Dec. 1973
Arthur W. Reese and Arnold Rathlev 15 Dec. 1973 579 p refs
(Contract DAAG11-70-C-0875)
(AD-778177/6) Avail: NTIS HC $31.75 CSCL 17/2

The volume presents COMSR communication requirements data developed for force model typical units. GRA

N74-32625# Joint Publications Research Service, Arlington, Va.
SCIENTIFIC MEETING ON ALL-UNION RADIO DAY, ABSTRACTS OF REPORTS
12 Aug. 1974 91 p Transl. into ENGLISH of "Vsesoyuznaya Nauchnaya Sessiya Posvyashchennaya Dnyu Radio, Annotatsii i Tezisy Dokladov" Moscow, 1974
(JPRS-62704) Avail: NTIS HC $7.75

Annotations and topics of reports are presented on multichannel communications, production communications, wave guides, postal communications and Soyuzpechat' main administration for the distribution of publications. Author

N74-32626# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MILLSTONE HILL RADAR PROPAGATION STUDY: SCIENTIFIC RESULTS, PART 1
John V. Evans, ed. 13 Nov. 1973 85 p Prepared in cooperation with Bell Telephone Labs., Inc., Murray Hill, N. J.
(Contracts F19628-73-C-0002; DAHC60-71-C-0005; DA Proj. 7X2-63304-D-214)
(AD-781179; TR-509-Pt-1; ESD-TR-73-259) Avail: NTIS CSCL 17/9

Satellites of the Navy Navigation Series were tracked simultaneously at UHF and L band to observe and measure the effects of ionospheric refraction, and UHF Thomson (incoherent) scatter soundings were made to study the ionosphere. The report presents the scientific results achieved during the course of the study. By averaging results obtained during many daytime satellite passes, the angular bias refraction of the UHF beacon signals caused by the earth's ionosphere was accurately determined. Good agreement was found between the measured values and predictions based upon ray-tracing studies (performed at BTL using incoherent-scatter electron-density profiles), together with real-time estimates of the electron content along the line-of-sight to the satellite by means of a differential-Doppler experiment. (Modified author abstract) GRA

N74-32627# Naval Postgraduate School, Monterey, Calif.
MINIATURE DIGITAL TELEMETRY SYSTEM EMPLOYING CYCLIC TIME MULTIPLEXING DESIGNED FOR POTENTIOMETRIC TRANSDUCERS M.S. Thesis
William Gadino Mar. 1974 77 p refs
(AD-781410) Avail: NTIS CSCL 09/6

The paper describes the design and testing of a miniature multi-channel digital telemetry system designed specifically for use in remote controlled model aircraft experiments coordinated by the Aeronautical Engineering Department at the Naval Postgraduate School. The avionics package comprised of data encoder/multiplexer circuitry and a transmitter is lightweight, inexpensive, small in physical size, has low current drain and is capable of transmitting up to nine channels of data. The system was designed specifically for transducers with potentiometric outputs although transducers having voltage or current outputs can be interfaced with the system. The thesis emphasizes the engineering design requirements and working design models to achieve efficient system performance. Author (GRA)

N74-32628# Army Land Warfare Lab., Aberdeen Proving Ground, Md.
FOLIAGE PENETRATION (FOPEN) RADAR DETECTION OF LOW FLYING AIRCRAFT Final Report
Louis V. Surgent, Jr. Apr. 1974 61 p refs
(AD-781486; LWL-TR-74-72) Avail: NTIS CSCL 17/9

The report describes detection experiments performed with the Foliage Penetration (FOPEN) Radar operating at 140 MHz in which the target was a helicopter flying nap-of-the-earth (NOE). Preliminary experiments performed in Hawaii during the user evaluation of the FOPEN system demonstrated the ability of this radar to detect helicopters flying NOE using foliage and terrain for cover. A series of experiments at Aberdeen Proving Ground were made to establish the detection ranges through foliage for a single UH-1 helicopter. Additional measurements of the radar cross section of the UH-1 on the ground were taken using the LWL Airborne Foliage Penetration Radar, and are also reported. The report concludes with a theoretical analysis of the propagation losses affecting the detection of aircraft flying NOE by radars operating at frequencies of from 100 to 10,000 MHz. GRA

N74-32629# Radiation Research Associates, Inc., Fort Worth, Tex.
THE EFFECTS OF MULTIPLE SCATTERING ON BACKSCATTER LIDAR MEASUREMENTS IN FOGS Final Report, 1 Aug. - 30 Nov. 1973
Wolfram G. Blattner, Dave G. Collins, and Michael B. Wells 31 Jan. 1974 92 p refs
(Contract F19628-73-C-0130; AF Proj. 7621)
(AD-781801; RRA-T7402; AFCRL-TR-74-0168) Avail: NTIS CSCL 20/6

Monte Carlo calculations were run to determine the effect of multiple scattering in the atmosphere on the return signal measured by a Mark VIII ruby lidar system for fogs with meteorological ranges of 80, 100, 200, 300, 400, and 2100 meters. The multiple scattering calculations were made using the TPART-3 Monte Carlo procedure which treats time-dependent light scattering in the atmosphere for collimated sources and receivers. The TPART-3 procedure is described and the results of calculations run to determine time-dependent single and multiple scattered fluxes at the receiver for a ruby lidar are presented for fogs with meteorological ranges between 80 and 2100 meters. (Modified author abstract) GRA

N74-32630# Ohio State Univ., Columbus. ElectroScience Lab.
AN ADAPTIVE ARRAY AND ANGLE OF ARRIVAL ESTIMATION SYSTEM FOR SENSOR COMMUNICATIONS Final Report
W. G. Swarner and A. J. Berni Apr. 1974 153 p refs
(Contract DAAG39-72-C-0169)
(AD-780163; ESL-3435-2) Avail: NTIS CSCL 17/4

Design, development, and testing of a 4-element 4-channel adaptive array for interference rejection and of an angle of arrival estimation device for use with the Phase III remote sensor communications system are described. The adaptive array provides simultaneous monitoring of four selected sensor channels within the 162-174 MHz sensor band while nulling up to three interfering signals from spatial directions to within 2.5 degrees of the desired signals. The angle of arrival estimation system determines directions of multiple incident signals simultaneously. (Modified author abstract) GRA

N74-32631# Naval Postgraduate School, Monterey, Calif.
A WIDEBAND RF APPLICATION OF FIBER OPTICS M.S. Thesis
Jessie Clarence Ross, Jr. Jun. 1974 73 p refs
(AD-781867; NPS-32JR74061) Avail: NTIS CSCL 17/2

Recent progress in optoelectronic technology makes practical point-to-point optical data transmission systems consistent with military requirements and potentially far superior to wire techniques. This project provides survey of the current state-of-the-art technology and investigates the feasibility of a fiber optic interface between a receiving antenna and radio receiver in the high frequency spectrum. An optoelectronic interface based on the use of conventional multimode fiber optics with a light emitting diode optical source and a hybrid silicon photodiode-preamplifier photodetector was designed, constructed, and tested. Signal reception for the interfaced system was observed throughout the receiver spectrum. Author (GRA)

N74-32508* Kanner (Leo) Associates, Redwood City, Calif.
RADIO COMMUNICATIONS WITH EXTRA-TERRESTRIAL CIVILIZATIONS
V. A. Kotelnikov *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 79-82 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 280-282
(For availability see N74-32500 22-04)
CSCL 17B

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N74-32632 Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Automatique.
SEQUENTIAL AUTOMATA Final Report [AUTOMATISMES A SEQUENCES]
J. Marchand, G. Guidez, G. Thuillier, M. Blanchard, J. C. Cavarroc, and J. Gillon Jul. 1973 400 p refs In FRENCH
(Contract DGRST-71-7-2912)
Avail: Issuing Activity

The modular conception of industrial asynchronous logical automata for command and control is presented. Original methods for the description representation and system synthesis using PETRI network are used. Classical tools and automata structure at implementation level are discussed together with economic criteria with regard to cost function establishment. The simplification of PETRI networks is detailed from a theoretical and computerized point of view. Actual computer programs and implementation details are provided. The modular implementation at electronic module package level of PETRI network is studied. Two types of module conception for the various functions (attribution, transfer, control, selection, distribution) are compared so as to recommend a preferred embodiment. A logical modular simulator was built and its scalization is detailed. Two operating modes are identified: the autonomous mode for the design laboratory and equipment control test and the slave mode as computer peripheral. ESRO

N74-32633 Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Informatique.
IMPLEMENTATION OF THE PROCOL COMPUTING LANGUAGE Final Report [MISE EN OEUVRE DU LANGAGE PROCOL]
[1973] 102 p In FRENCH
(Contract DGRST-72-7-0543)
Avail: Issuing Activity

The performance of the real time application programming language PROCOL for minicomputers was evaluated. The main advantage of this language is shown to be the ease with which concepts related to industrial process control can be handled. The main criteria for evaluation were: language learning curve, organic analysis simplification, reduction in programming time, and ease of program testing and debugging. The net result is the reduction in the cost of computerized industrial automation. ESRO

N74-32634*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
CREW/COMPUTER COMMUNICATIONS STUDY. VOLUME 2: APPENDIXES
J. D. Johannes Feb. 1974 130 p
(Contract NAS8-25701)
(NASA-CR-120308; MDC-G5312-Vol-2) Avail: NTIS HC $9.50 CSCL 09B

The software routines developed during the crew/computer communications study are described to provide the user with an understanding of each routine, any restrictions in use, the required input data, and expected results after executing the routines. The combination of routines to generate a crew/computer communications application is also explained. The programmable keyboard and display used by the program is described, and an experiment scenario is provided to illustrate the relationship between the program frames when they are grouped into activity phases. Program descriptions and a user's guide are also presented. For Vol. 1, see N74-18843. A.A.D.

N74-32635# National Center for Atmospheric Research, Boulder, Colo. Facilities Lab.
FELLOWSHIP IN SCIENTIFIC COMPUTING, SUMMER 1973 Summary Reports
Jeanne C. Adams, ed. and Russell K. Rew, ed. Dec. 1973 251 p refs Sponsored by NSF
(NCAR-TN/PROC-90) Avail: NTIS HC $15.75

Summary reports are presented on computer simulated meteorological systems, including system development and numerical procedures for solving problems caused by certain meteorological conditions. Data are also given on procedures for converting between different systems. For individual titles, see N74-32636 through N74-32645.

N74-32636 Michigan Univ., Ann Arbor.
COMPARISON OF METHODS FOR CONVERTING BETWEEN PRESSURE AND HEIGHT SURFACES c19
Grant Branstator *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 1-9 (For availability see N74-32635 22-08)

Three methods are proposed to solve the problem of converting one meteorological parameter into another. Specifically, attempts were made to convert pressure to height surfaces. Analytically defined atmospheric models were used to solve and illustrate each method. Author

N74-32637 Purdue Univ., Lafayette, Ind.
A NUMERICAL SOLUTION TO A MODEL OF UNSTEADY, ADVECTIVE DIFFUSION OF MATERIAL IN THE ATMOSPHERE c13
Kenneth E. Dowell *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 11-32 refs (For availability see N74-32635 22-08)

Numerical solutions to a model that describes dispersion of material in the atmosphere were examined. The model incorporates an empirical eddy diffusivity model of dispersion. Advection of material by a time varying wind is included in the model. An analytic solution was presented by Nunge for a few specific cases but a numerical solution for this model was not previously demonstrated. Author

N74-32638 Massachusetts Inst. of Tech., Cambridge.
THE STRUCTURE OF NEUTRAL THERMOSPHERIC WINDS AT MILLSTONE HILL, MASSACHUSETTS INFERRED FROM INCOHERENT BACKSCATTER RADAR MEASUREMENTS c13
Barbara Emery *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 33-55 refs (For availability see N74-32635 22-08)

The neutral wind system over the Millstone Hill backscatter radar near equinox March 23 and 24, 1970 was determined. Three empirical models of the thermospheric pressure distribution are used to specify the pressure gradient over Millstone Hill. The wind system is determined from a three-dimensional model of the neutral thermosphere using the pressure forces derived from the empirical models. The component of motion along the geomagnetic field line is calculated from the winds and compared to the drift measurements made over Millstone Hill. Another comparison is made between the harmonic analysis of the measured exospheric temperature and that calculated by the empirical models. Thus, it is possible to evaluate the empirical models in terms of the wind system and the structure of the exospheric temperature. The three-dimensional dynamic model of the neutral thermosphere is also used to determine the best wind and temperature structure that reproduce the measured ion temperature and plasma drift over Millstone Hill for a particular day. Author

N74-32639 Woods Hole Oceanographic Institution, Mass.
THE RECTIFIED RESPONSE OF A TWO LAYER MODEL OCEAN TO A TIME DEPENDENT FORCING c13
Dale Bruce Haidvogel *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 57-93 refs (For availability see N74-32635 22-08)

Analytical theories and mathematical models for studying wind driven ocean circulation patterns and energy balance are reported. The contribution of time dependent and small scale processes to the energetics of the system are also studied. E.H.W.

N74-32640 Columbia Univ., New York.
TRANSITIVITY EXPERIMENTS IN SEMI-EMPIRICAL TIME-DEPENDENT CLIMATE MODELS c20
Jane Hsiung *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 95-107 refs (For availability see N74-32635 22-08)

The semiempirical climate models of Schneider and Gal-Chen were studied in order to test the transitivity in the asymptotic, steady state solutions using perturbations in the initial

conditions. Attempts were also made to determine the cause of intransitivity seen in the models. Author

N74-32641 Illinois Univ., Urbana.
BOUNDARY CONDITIONS FOR A BAROTROPIC FORECAST MODEL **c20**
Mary Alice Rennick *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 109-129 refs (For availability see N74-32635 22-08)

A barotropic forecast model was used to test several different sets of boundary conditions, to determine their suitability for use in a limited area forecast model. The results are compared on the basis of stability, freedom from distortion, and general acceptability of the forecast. Author

N74-32642 Pennsylvania State Univ., University Park.
FRONTOGENESIS IN A TWENTY LEVEL ISENTROPIC PRIMITIVE EQUATION MODEL **c20**
Hampton N. Shirer *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 131-152 refs (For availability see N74-32635 22-08)

Cross sectional analysis and its use to locate sub synoptic scale frontal zones from high vertical resolution synoptically spaced data was discussed. Author

N74-32643 Harvard Univ., Cambridge, Mass.
FORCED EQUATORIAL PLANETARY WAVES **c30**
Duane E. Stevens *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 153-168 refs (For availability see N74-32635 22-08)

An evaluation, using Lindzen's asymptotic analysis, was made of the atmosphere's response to generalized tropospheric forcing mechanism. Data are also given on the vertical propagation of equatorial waves through fields with vertical shear for all meridional wave numbers. Author

N74-32644 Washington Univ., Seattle.
MEASURED TROPICAL ATMOSPHERIC BOUNDARY LAYER CHARACTERISTICS COMPOSITED WITH RESPECT TO CLOUDS **c20**
Roland B. Stull *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 169-224 refs (For availability see N74-32635 22-08)

The tropical atmospheric boundary layer of Dec. 1972 was measured using the Buffalo aircraft. Flights were made over the southern tip of the Florida peninsula and north of Puerto Rico, and covered both land and water. Major emphasis was put on data taken over water north of Puerto Rico on Dec. 15. Data cover only a suppressed region with scattered cumulus clouds. The interaction between fair weather cumulus clouds and the tropical boundary layer was discussed. E.H.W.

N74-32645 Texas Univ., Austin.
NUMERICAL STUDY OF ROSSBY-WAVE CRITICAL LEVEL DEVELOPMENT IN A BAROTROPIC FLOW **c20**
George H. Ward *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 225-250 refs (For availability see N74-32635 22-08)

A numerical procedure for treating the problem of critical level behavior of a Rossby wave in its acquisition of a steady state structure following a switch on forcing is reported. Time evolution of the zonal wind was added as a variable in the procedure. Author

N74-32646*# National Aeronautics and Space Administration. Pasadena Office, Calif.
ANALOG TO DIGITAL CONVERTER Patent Application
Charles H. Lucas, inventor (to NASA) (JPL) Filed 27 Aug. 1974 25 p
(Contract NAS7-100)
(NASA-Case-NPO-13385-1; US-Patent-Appl-SN-501011) Avail: NTIS HC $4.25 CSCL 09B

An analog-to-digital converters, finding particular application in a multichannel pulse height analyzer, with a means for digitizing the analog input in two conversion steps is presented. To digitize the input to 13 bits, a 7-bit digital to analog converter (DAC) with a 7-bit up-down counter is used. During the first conversion step which is a coarse conversion, the input, V sub I, is compared with the DAC output, V sub L and the 7-bits of the counter are set by successive approximation. Thereafter, after settling, the DAC output is driven twice toward V sub I. The output of an amplifier of a gain 2 to the 7th power is stored after each change of the DAC in one of two storage and hold circuits, depending on the polarity of the amplifier output. Then, the content of the 7-bit counter is transferred to the 7 higher order bits of a 14-bit buffer counter. The fine conversion step is performed by successive approximation. NASA

N74-32647*# Purdue Univ., Lafayette, Ind. Lab. of Applications of Remote Sensing.
IMPLEMENTATION AND EVALUATION OF ILLIAC 4 ALGORITHMS FOR MULTISPECTRAL IMAGE PROCESSING Final Report
Philip H. Swain Jul. 1974 22 p refs
(Grant NGR-14-005-202)
(NASA-CR-139688; LARS-T-16-111273) Avail: NTIS HC $4.25 CSCL 09B

Data concerning a multidisciplinary and multi-organizational effort to implement multispectral data analysis algorithms on a revolutionary computer, the Illiac 4, are reported. The effectiveness and efficiency of implementing the digital multispectral data analysis techniques for producing useful land use classifications from satellite collected data were demonstrated. Author

N74-32648*# National Aeronautics and Space Administration. Pasadena Office, Calif.
NONLINEAR NONSINGULAR FEEDBACK SHIFT REGISTERS Patent Application
Marvin Perlman, inventor (to NASA) (JPL) Filed 27 Aug. 1974 40 p
(Contract NAS7-100)
(NASA-Case-NPO-13451-1; US-Patent-Appl-SN-501012) Avail: NTIS HC $5.00 CSCL 09B

Four classes of nonlinear nonsingular feedback shift registers (NLFSR) are disclosed. Each NLFSR, assumed to be r stages long, regardless of its class, generates a feedback sequence of length 2r is known. Each NLFSR of either class 1 or class 2 has a feedback arrangement which is a function of primitive polynomial of degree r-1. Each register of class 1 includes three nonlinear terms, each one of which is the AND function of a different combination of (r-1) outputs of the first (r-1) stages. Each register of class 2 includes a single nonlinear term which is the AND function of (r-1) outputs of the first (r-1) stages. Each NLFSR in class 3 has a feedback arrangement which is based on a primitive polynomial of degree r-2 and a unique single nonlinear term, while each NLFSR in class 4 has a feedback arrangement which is based on a primitive polynomial of degree r-3 and three nonlinear terms. NASA

N74-32649*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
MIDAS, PROTOTYPE MULTIVARIATE INTERACTIVE DIGITAL ANALYSIS SYSTEM, PHASE 1. VOLUME 2: DIAGNOSTIC SYSTEM Final Report, Oct, 1972 - Feb. 1974
F. J. Kriegler, Dempster Christenson, Michael Gordon, Roland Kistler, Seymour Lampert, Robert Marshall, and Rowland McLaughlin Aug. 1974 51 p
(Contract NAS1-11979)
(NASA-CR-132464; ERIM-195800-25-F-Vol-2) Avail: NTIS HC $3.75 CSCL 09B

The MIDAS System is a third-generation, fast, multispectral recognition system able to keep pace with the large quantity and high rates of data acquisition from present and projected sensors. A principal objective of the MIDAS Program is to provide a system well interfaced with the human operator and thus to obtain large overall reductions in turn-around time and significant gains in throughout. The hardware and software generated in Phase I of the over-all program are described. The system contains a mini-computer to control the various high-speed processing elements in the data path and a classifier which implements an all-digital prototype multivariate-Gaussian maximum likelihood decision algorithm operating 2 x 105 pixels/sec. Sufficient hardware was developed to perform signature extraction from computer-compatible tapes, compute classifier coefficients, control

the classifier operation, and diagnose operation. Diagnostic programs used to test MIDAS' operations are presented. Author

N74-32650*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
MIDAS, PROTOTYPE MULTIVARIATE INTERACTIVE DIGITAL ANALYSIS SYSTEM, PHASE 1. VOLUME 3: WIRING DIAGRAMS Final Report, Oct. 1972 - Feb. 1974
F. J. Kriegler, Dempster Christenson, Michael Gordon, Ronald Kistler, Seymour Lampert, Robert Marshall, and Rowland McLaughlin Aug. 1974 87 p
(Contract NAS1-11079)
(NASA-CR-132465; ERIM-195800-25-F-Vol-3) Avail: NTIS HC $4.00 CSCL 09B

The Midas System is a third-generation, fast, multispectral recognition system able to keep pace with the large quantity and high rates of data acquisition from present and projected sensors. A principal objective of the MIDAS Program is to provide a system well interfaced with the human operator and thus to obtain large overall reductions in turn-around time and significant gains in throughput. The hardware and software generated in Phase I of the overall program are described. The system contains a mini-computer to control the various high-speed processing elements in the data path and a classifier which implements an all-digital prototype multivariate-Gaussian maximum likelihood decision algorithm operating at 2 x 100,000 pixels/sec. Sufficient hardware was developed to perform signature extraction from computer-compatible tapes, compute classifier coefficients, control the classifier operation, and diagnose operation. The MIDAS construction and wiring diagrams are given. Author

N74-32651*# Intermetrics, Inc., Cambridge, Mass.
ADVANCING HAL TO AN OPERATIONAL STATUS Final Report, Oct. 1971 - Jul. 1974
Jul. 1974 201 p refs
(Contract NAS9-12291)
(NASA-CR-140222; FR-88-74; MSC-05107) Avail: NTIS HC $13.25 CSCL 09B

The development of the HAL language and the compiler implementation of the mathematical subset of the language have been completed. On-site support, training, and maintenance of this compiler were enlarged to broaden the implementation of HAL to include all features of the language specification for NASA manned space usage. A summary of activities associated with the HAL compiler for the UNIVAC 1108 is given. Author

N74-32652# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
PERFORMANCE CHARACTERISTICS OF TWO FREQUENCY-TRACKING DEMODULATORS AND A COUNTING SYSTEM: MEASUREMENTS IN AN AIR JET
D. F. G. Durao and J. H. Whitelaw Mar. 1974 30 p refs Presented at Laser Velocimetry Workshop, Lafayette, Ind., Mar. 1974 Sponsored by NATO and Inst. de Alta Cultura
(HTS/74/12) Avail: NTIS HC $4.50

Performance characteristics of a prototype of the DISA frequency-tracking demodulator, a prototype of the Cambridge-Consultants frequency-tracking demodulator and a counting system based on the Hewlett-Packard Computing Counter were compared. Measurements with simulated velocity signals indicate that the linearity and noise characteristics of the two trackers are satisfactory but the latter indicates the need to track at locations higher than 15% of the nominal range maximum. To obtain maximum frequency response the preferred locations for the prototype DISA and Cambridge Consultants instruments are approximately 40% and 60%, respectively of the nominal range maxima. The frequency response of the prototype Cambridge Consultants instrument is shown to be better than that of the prototype of the DISA instrument. The performance of the counting system is not subject to the same limitations as the tracking instrument but its data acquisition rate limits its ability to measure turbulence energy spectra with frequencies above around 500 Hz. Author

N74-32653# Computer Sciences Corp., Falls Church, Va.
UPGRADED THIRD GENERATION INFORMATION FLOW REQUIREMENTS ANALYSIS. VOLUME 1: SUMMARY Final Report, Mar. - Sep. 1973
John C. Hansen, R. L. Weirich, E. Stevens, E. M. Boseck, and B. Adams Sep. 1973 62 p
(Contract DOT-FA72WA-3072)
(AD-773434; FAA-RD-73-65-Vol-1) Avail: NTIS HC $3.75

FAA information transfer requirements are organized into four categories, representing National Aviation System Status, Flight Movement, Flight Planning and Air Traffic Management. The communications requirements are defined and analyzed for the 1975-1985 time frame. The analysis is based on air traffic forecasts for the time period and the communications associated with anticipated upgraded third generation air traffic planning, status, control, and management capabilities. These lead to a specific Statement of Requirements for air and ground communications applicable to flight operations in the upgraded third generation air traffic control environment. Author

N74-32654# Computer Sciences Corp., Falls Church, Va.
UPGRADED THIRD GENERATION INFORMATION FLOW REQUIREMENTS ANALYSIS. VOLUME 2: ANALYSIS Final Report, Mar. - Sep. 1973
John C. Hansen, R. L. Weirich, E. Stevens, E. M. Boseck, and B. Adams Sep. 1973 151 p
(Contract DOT-FA72WA-3072)
(AD-773435; FAA-RD-73-65-Vol-2) Avail: NTIS HC $5.00
For abstract, see N74-32653.

N74-32655# Computer Sciences Corp., Falls Church, Va.
UPGRADED THIRD GENERATION INFORMATION FLOW REQUIREMENTS ANALYSIS. VOLUME 3: APPENDICES Final Report, Mar. - Sep. 1973
John C. Hansen, R. L. Weirich, E. Stevens, E. M. Boseck, and B. Adams Sep. 1973 294 p refs
(Contract DOT-FA72WA-3072)
(AD-773436; FAA-RD-73-65-Vol-3) Avail: NTIS HC $6.75
For abstract, see N74-32653.

N74-32656# Sandia Labs., Albuquerque, N.Mex.
TIME CODE DECODER FOR MINI-COMPUTERS
A. F. Veneruso Mar. 1974 26 p refs
(Contract AT(29-1)-789)
(SLA-73-966) Avail: NTIS HC $4.50

A time code decoder designed to decode the second, minute, hour, and day information contained in the IRIG-Format B time code is described. The results of laboratory tests conducted to demonstrate the decoder's capability are presented, and software changes that enable the decoder to decode any other time code format are discussed. Specifically, the decoder program modifications required for operation with the IRIG-A, NASA 36-Bit, and White Sands Missile Range Type G-2 time codes are presented. Author (NSA)

N74-32657# California Univ., Los Angeles. Dept. of System Sciences.
BALANCED CONVOLUTIONAL SOURCE AND CHANNEL CODING Final Report
Andrew J. Viterbi 31 May 1974 30 p refs
(Grant DA-ARO(D)-31-124-71-G89)
(AD-780990; AROD-9686-3-EL) Avail: NTIS CSCL 09/4

A convolutional source coding technique, which is the dual of the well-known maximum likelihood convolutional channel decoding algorithm, has been analyzed and its performance bounded in terms of the rate-distortion function. The source encoder is equivalent to a channel (trellis) decoder, while the source decoder is equivalent to a channel (shift register) encoder. Thus the complexity of the source encoder balances the simplicity of the channel encoder, while the simplicity of the source decoder balances the complexity of the channel decoder. Consequently, the transmitting and receiving terminals are almost symmetrical. (Modified author abstract) GRA

N74-32658# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A FERROMAGNETIC STORAGE CELL WITH A SETTING FROM 2 TO 8
V. M. Dmitriev, R. A. Lipman, and V. V. Popov 17 Jun. 1974 11 p refs Transl. into ENGLISH from the book "Mnogoustoichivye Elementy i Ikh Primenenie" USSR, 1971 p 123-129
(AD-781628; FTD-HT-23-1012-74) Avail: NTIS CSCL 09/2

The examined cell performs the function of one stage of a storage accumulator with overflow readout, and works on the principle of step-wise magnetic phase reversal of a ferromagnetic core according to the partial cycles of a hysteresis loop. GRA

N74-32659# Rockwell International Corp., Anaheim, Calif. Electronics Research Div.
HIGH DATA RATE MAGNETIC MEMORY DEVICES Semiannual Report, 1 Apr. 1973 - 1 Jan. 1974
Peter K. George Mar. 1974 89 p refs
(Contract DAAB07-70-C-0258)
(AD-781577; C74-174/501; ECOM-0258-5-70; SAR-1) Avail: NTIS CSCL 09/2

The report describes the progress currently being made toward establishing a BORAM chip design at Rockwell International under ECOM Contract DAAB07-70-C-0258. The work reported here represents a continuation of the previous progam which was aimed at developing high frequency components and materials. The emphasis of this report is on device modeling and its application to detector design, high frequency material evaluation. Although a feasibility chip is being constructed in connection with this program the details of the latter work will be reported in the following annual report. This report deals primarily with the preliminaries required to establish that chip design and the choice of material required for operation at 250 kHz. The detector sensitivity measurements reported here were done in connection with another program as was the high frequency material development (growth of Ca-Ge). Author (GRA)

N74-32825 Telespazio, S.p.A., Rome (Italy).
ON-BOARD AND GROUND DATA PROCESSING IN SPACELAB FOR EARTH RESOURCES
G. Bressanin *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 35 p refs (For availability see N74-32811 22-13)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N74-32660* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MILLIMETER WAVE PUMPED PARAMETRIC AMPLIFIER Patent
Lawrence E. Dickens, inventor (to NASA) (Westinghouse Elec. Corp., Pittsburgh) Issued 3 Sep. 1974 7 p Filed 2 Oct. 1973 Supersedes N74-10200 (12 -01, p 0026) Sponsored by NASA
(NASA-Case-GSC-11617-1; US-Patent-3,833,857; US-Patent-Appl-SN-402865; US-Patent-Class-330-4.9; US-Patent-Class-330-53) Avail: US Patent Office CSCL 09A

A negative resistance parametric amplifier is reported that employs a discrete varactor diode for high frequency pump excitation in the millimeter wave range.
Official Gazette of the U.S. Patent Office

N74-32661 Commissariat a l'Energie Atomique, Grenoble (France). Lab. de Microelectronique.
INTEGRATED CIRCUITS WITH MOS TRANSISTORS OBTAINED BY ION IMPLANTATION UTILISING ASSOCIATED TRANSISTORS ENRICHED/DEPLETED THROUGH 'IDEAL' TECHNOLOGY (IMPLANTED, DEPLETED WITH ALIGNED GRID TRANSISTORS) Final Report [ETUDE ET REALISATION PAR IMPLANTATION IONIQUE DE CIRCUITS INTEGRES A TRANSISTORS MOS ASSOCIANT DES TRANSISTORS A ENRICHISSEMENT ET A APPAUVRISSEMENT EN UTILISANT LA TECHNOLOGIE 'IDEAL' (TRANSISTORS IMPLANTES A DEPLETION ET GRILLE ALIGNEE)]
J. Borel, B. Ducollet, and J. P. Suat 9 Aug. 1973 40 p refs In FRENCH
(Contract DGRST-72-7-0537)
Avail: Issuing Activity

The characterization of the IDEAL technology is presented. The IDEAL system is concerned with MOS enrichment/depletion with grid adjustment by ion implantation. The objective of the study is a circuit production at the fastest speed compatible with the technology. A Johnson decade counter compatible with T.T.L. output was chosen as the circuit. The study was conducted in three phases: acquisition of the electrical parameters required for the simulation, simultation and optimization of a test circuit, and merit factor measurement; implementation of the Johnson decade test circuit; and study of the Johnson decade and electric measurements on circuits. The corresponding results are detailed. For a divider by 10 working at 10 MHz and charge capacitance of 0.95 pF the merit factor is 12 pJ, i.e. at least two times better than current technology permits. ESRO

N74-32662 Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
CHARACTERIZATION, CONCEPTION, AND SIMULATION METHODS FOR POWER TRANSISTORS Final Report [METHODES DE CARACTERISATION, DE CONCEPTION ET DE SIMULATION DES TRANSISTORS DE PUISSANCE]
P. Leturcq 15 Nov. 1973 182 p refs In FRENCH; ENGLISH summary
(Contract DGRST-72-7-0521)
(LAAS-Publ-1068) Avail: Issuing Activity

A model, developed by computer aided design and analysis, of power bipolar transistors is presented. The structure of this model is cellular and involves two partial models, an electrical model and a thermal model. All the fundamental physical mechanisms of transistor action are taken into account. Theoretical and experimental behavior of real devices were found in very good fit, thermal second breakdown included. The model is applicable to transistors of homobase, epitaxial base, planar, triple diffused technologies, ring-dot, line, and inter-digitated configurations. the three static operating modes-normal, saturated and avalanche modes-were treated with a short computation time. Author (ESRO)

N74-32663 SILEC-Semiconducteurs, Paris (France).
DEEP GALLIUM DIFFUSION AND LOCALIZATION BY SILICON NITRIDE Final Report [DIFFUSION PROFONDE DU GALLIUM AVEC LOCALISATION PAR LE NITRURE DE SILICIUM]
J. P. Bouchaud and P. Cheron Jan. 1973 85 p refs In FRENCH
(Contract DGRST-71-7-2817)
Avail: Issuing Activity

The uses of silicon nitride as masking a agent for deep gallium diffusion in non-oxidant phases (sealed tube techniques) are described. A chemical reactor for cold wall epitaxy was built. The optimal conditions to be fulfilled for adequate nitride films are discussed and the criteria for their use as diffusion masks are defined. These masks are used for thyristors, thyratrons, and crystal rectifier fabrication. The electric characteristics of these devices together with other original structures (disk diodes, punch through diodes, darlistors) are discussed, and comments are given on the most interesting structures. ESRO

N74-32664 Commissariat a l'Energie Atomique, Grenoble (France). Lab. d'Electronique et de Technologie de l'Informatique.
NEW INTERCONNECTION METHODS APPLIED TO MOS TECHNOLOGY Final Report [NOUVEAUX PROCEDES D'INTERCONNEXIONS APPLIQUES A LA TECHNOLOGIE MOS]
M. Montier, K. Heber, and L. Peccoud Aug. 1973 45 p refs In FRENCH
(Contract DGRST-72-7-0534)
Avail: Issuing Activity

The realization of self-positioning electrical contacts is presented. A structure is sought whereby the engraving step of the contacts on an insulator is replaced by the selective elimination of a suitable oxide deposited on previously engraved metallic parts. Various solutions are discussed depending on selective chemical attack or selective insulation deposition. The operating conditions, instrumentation, and chemical reactions are detailed. The anodic oxidation of thin films of deposited Al is discussed

with regard to interconnection engraving applications and defect reduction. Main parameters of the process are discussed for optimization on an industrial scale. ESRO

N74-32665 Bordeaux Univ. (France). Lab. de Chimie Minerale Structurale.
NEW DIELECTRICS FOR MINIATURE CAPACITORS OF HIGH EFFICIENCY Final Report [RECHERCHE ET ETUDE DE NOUVEAUX DIELECTRIQUES POUR CONDENSATEURS MINIATURISES DE HAUTE]
Dec. 1973 23 p refs In FRENCH
(Contract DGRST-72-7-0524)
Avail: Issuing Activity

The dielectric properties of various fluorides are discussed with regard to permittivity and loss angle tangent steepness. Replacement of the oxygen atom by F in some ferroelectric materials with low Curie point yields a high permittivity temperature stability and low losses. These compounds are shown to be of use in capacitors of the pile up type. The roll up method was also considered. The method of shaping and characterization of the new compounds are outlined. ESRO

N74-32666 Centre de Recherches de la Compagine Generale d'Electricite, Marcoussis (France). Dept. Energie.
PARAMETERS CONTROLLING THE SUPERCONDUCTING PROPERTIES OF Nb3 (Al, Ge) SHEETS OBTAINED BY CATHODIC DEPOSITION Final Report [ETUDE DES PARAMETERES CONTROLANT LES PROPRIETES SUPRACONDUCTRICES DE RUBANS DU COMPOSE Nb3 (Al, Ge) REALISES PAR PULVERISATION CATHODIQUE]
J. C. Renard Dec. 1973 24 p refs In FRENCH
(Contract DGRST-72-7-0696)
Avail: Issuing Activity

The intrumentation required for cathodic deposition of Nb3 (Al,Ge) on hot substrates between 150 and 750 C is presented. Deposition rate control is detailed, and the results are discussed with regard to the deposit properties which are determined by chemical analysis, X-ray analysis, and critical temperature measurement. ESRO

N74-32667 Centre de Recherches de la Compagine Generale d'Electricite, Marcoussis (France). Section Composants Electroniques.
OPTICAL GAIN-BANDWIDTH PRODUCT CONDITION FOR AVALANCHE PHOTODIODES Final Report [ETUDE DES CONDITIONS PERMETTANT D'OBTENIR LE PRODUIT GAIN-BANDE OPTIMAL DES PHOTODIODES A AVALANCHE]
J. Benoit and G. Ripoche Nov. 1973 99 p refs In FRENCH
(Contract DGRST-72-7-0518-00-221-75-01)
Avail: Issuing Activity

The influence of various technological and experimental parameters on low frequency photomultiplication of avalanche photodiodes with abrupt NP structure is discussed. A mathematical model taking into account space charge effects was developed. The important criterion for optimal gain is the total resistance. Impulse analysis methods have shown that the passband of common photodiodes is independent of the multiplication effect, the high frequency cut off being due to a decrease in quantic yield. The avalanche diodes with structure p-pi-pn whose effective product gain bandwidth is higher than 50 GHz are immune to this effect, which is of interest for high frequency detection at 9000 angstroms and 1.06 microns. The implementation of such devices is subject to severe technological difficulties, which are discussed. ESRO

N74-32668 Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
DEVELOPMENT AND CHARACTERIZATION OF ULTRATHIN SILICA FILMS (LESS THAN 500 A) ON SILICON SUBSTRATE Final Report [REALISATION ET CARACTERISATION DE COUCHES TRES MINCES DE SILICE (PLUS PETIT QUE 500 A) EN SURFACE DU SILICIUM]
M. Crozet Sep. 1973 59 p refs In FRENCH
(Contract DGRST-72-7-0533)
Avail: Issuing Activity

The oxidation techniques used were either at room temperature in air and controlled atmospheres, or at high (1220 C) and low (580 C) temperatures with organic electrolyte. The thin film analysis was performed by nuclear microanalysis to check composition and growth, ellipsometry for thickness monitoring, and electric measurements for flashover, charge density in oxide layers. Two thickness ranges were studied in more detail from zero to 50 angstroms and from 50 to 500 angstroms. The growth kinetics were compared. Applications to Si-silica capacitors and MOS microwave transistors with an ultrashort channel are discussed. ESRO

N74-32669 Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
DOMAINLESS GUNN EFFECT IN SHORT SAMPLES Final Report [ETUDE DE L'EFFET GUNN SANS DOMAIN EN ECHANTILLONS COURTS]
M. Convert and M. Moutou Jul. 1973 75 p refs In FRENCH
(Contract DGRST-70-7-2334)
Avail: Issuing Activity

Capabilities of the domainless Gunn effect in short samples for application to superhigh frequency oscillators is presented. The aim was to reach a 100 W peak power, 100 mW mean power with one microsecond pulse at 1000 Hz repetition rate. Simple diodes were studied to increase unit power; these were then series-coupled. The power dissipation aspects are detailed. Main results are 56 W at 6 GHz, 15 W at 8 GHz, 3 W at 12 GHz, 5 W at 16 GHz with a form factor of 1,000, and 3 W at 16 GHz with a form factor of 40 (duration one microsecond, repetitivity 25 KHz). ESRO

N74-32670 Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
INTERACTION OF CHARGED PARTICLE BEAMS WITH THIN FILM DIELECTRICS Final Report [ETUDE DE L'INTERACTION FAISCEAU DE PARTICULES CHARGEES, DIELECTRIQUES EN COUCHES MINCES]
M. Croset, R. Poirier, L. M. Mercandalli, N. Szydlo, and D. Dieumegard Sep. 1973 73 p refs In FRENCH
(Contract DGRST-72-7-0092-00-221-75-01)
Avail: Issuing Activity

The study of defects created by ion implanation in a thin film dielectric on a Si substrate is presented. The influence of such defects is discussed with regard to refractive index, thickness, dielectric constant, and rigidity. The influence on the solubility velocity, charge density, and traps per sq cm are detailed together with variations on profile and mobility of the obtained thin films. ESRO

N74-32671 Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
SYNTHESIS OF LIQUID CRYSTALS WITH VARIABLE BIREFRINGENCE IN AN ELECTRIC FIELD Final Report [SYNTHESE DE CRISTAUX LIQUIDES A BIREFRINGENCE VARIABLE DANS UN CHAMP ELECTRIQUE]
J. C. Dubois and A. Zann Oct. 1973 43 p refs In FRENCH
(Contract DGRST-72-7-0556)
Avail: Issuing Activity

The synthesis methods for about 30 compounds exhibiting variable birefringence under externally applied electric fields are presented. The synthesis methods are detailed and the liquid nematic crystals with positive dielectric anisotropy are characterized with regard to their use as display devices in the so called helical nematic state. The compounds belong to the family of Schiff bases with a nitrile in position para. New families of nitrile-Schiff or fluoro-Schiffs were considered. Other compounds belong to the bensoic esters, nitrilated or fluorinated. Fifteen mixtures of such compounds were prepared to widen the mesomorphism range. Stable mixtures with mesomorphism range close to ambient temperature were obtained. ESRO

N74-32672 Radiotechniques S. A., Caen (France). Lab. de Recherches et de Developpements Avances.
MATHEMATICAL MODEL OF THE UNIT TRANSISTOR ADAPTED TO INTEGRATED CIRCUITS. APPLICATION TO DEFECT CHARACTERIZATION Final Report [MODELE MATHEMATIQUE DU TRANSISTOR UNITE ADAPTE AUX CIRCUITS INTEGRES ET APPLICATION A LA CARACTERISATION DES DEFAUTS]

P. Leduc 21 Nov. 1973 92 p refs In FRENCH
(Contract DGRST-72-70-431-00-221-75-81)
Avail: Issuing Activity

A mathematical model for a so-called unit transistor is presented. It is valid in dc and is used to characterize the set of transistors deriving from a given technology. The theoretical basis stems from the parameters of the IBIS model (parameters as functions of the geometrical dimensions taken in the masking plane, interrelation of parameters by physical laws). The model is applied to a video frequency transistor already in the production stage and to integrated circuit transistors for fast logic. ESRO

N74-32673 Radiotechnique-Compelec, Paris (France). Lab. Hyperfrequence.
IMPROVEMENT OF FABRICATION EFFICIENCY FOR HIGH POWER CW GUNN DIODES Final Report [AMELIORATION DU RENDEMENT DE FABRICATION DES DIODES A EFFET GUNN CW DE FORTE PUISSANCE]
C. Lebrun, M. Boucher, and M. Touratier Dec. 1973 16 p In FRENCH
(Contract DGRST-72-7-0437)
Avail: Issuing Activity

A study on the improvement of the power efficiency of Gunn diodes is presented. The diodes operate in X band and deliver between 50 to 200 mW under eight to nine volts. Major problems for fabrication of such diodes are substrates, ohmic contacts, thermal dissipation, material degradation upon processing, and electrical measurements. The technological process used is evaporation on the two sides of an epitaxy material, a deeply imbeeded ohmic contact alloyed with AsGa and furnace heating. A first masking limits the circular zones where a metallic sole is deposited; then a second masking on the substrate side allows for the mesa attack. ESRO

N74-32674*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VARIABLE BEAMWIDTH ANTENNA Patent Application
R. F. Schmidt, inventor (to NASA) Filed 27 Aug. 1974 25 p
(NASA-Case-GSC-11862-1; US-Patent-Appl-SN-500979) Avail: NTIS HC $4.25 CSCL 09E

A double parabolic cylinder antenna is reported that has telescoping sections on the main reflector and sub-reflector to provide continuous bidirectional zooming of a beam. By positioning a monopulse feed within the Airy disc and rotating the feed to compensate for changes in the geometry of the antenna during zooming, bidirectional zooming capability in monopulse radar is achieved. NASA

N74-32675*# National Aeronautics and Space Administration. Pasadena Office, Calif.
A dc REGULATOR HAVING FEEDFORWARD CONTROL Patent Application
Gene W. Wester, inventor (to NASA) (JPL) Filed 30 Aug. 1974 14 p
(Contract NAS7-100)
(NASA-Case-NPO-13481-1; US-Patent-Appl-SN-502139) Avail: NTIS HC $4.00 CSCL 09E

An improved free-running dc regulator with feedforward control, is disclosed. The feedforward control functions to maintain the frequency of the dc regulator substantially constant by varying the duty ratio in inverse proportion to changes in the source voltage being regulated. NASA

N74-32676*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
OPTIMAL OUTPUT FEEDBACK CONTROL OF LINEAR SYSTEMS IN PRESENCE OF FORCING AND MEASUREMENT NOISE
Suresh M. Joshi 27 Aug. 1974 23 p refs
(NASA-TM-X-72003) Avail: NTIS HC $3.00 CSCL 09C

The problem of obtaining an optimal control law, which is constrained to be a linear feedback of the available measurements, for both continuous and discrete time linear systems subjected to additive white process noise and measurement noise was Necessary conditions are obtained for minimizing a quadratic performance function for both finite and infinite terminal time cases. The feedback gains are constrained to be time invariant for the infinite terminal time cases. For all the cases considered, algorithms are derived for generating sequences of feedback gain matrices which successively improve the performance function. A continuous time numerical example is included for the purpose of demonstration. Author

N74-32677*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A HIGH VOLTAGE POWER SUPPLY FOR THE AE-C AND D LOW ENERGY ELECTRON EXPERIMENT
Joseph A. Gillis Jul. 1974 27 p refs
(NASA-TM-X-70746; X-711-74-244) Avail: NTIS HC $4.50 CSCL 09E

A description is given of the electrical and mechanical design and operation of high voltage power supplies for space flight use. The supply was used to generate the spiraltron high voltage for low energy electron experiment on AE-C and D. Two versions of the supply were designed and built; one design is referred to as the low power version (AE-C) and the other as the high power version (AE-D). Performance is discussed under all operating conditions. Author

N74-32678# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
SOME PERFORMANCE CHARACTERISTICS OF THE PROTOTYPE DISA FREQUENCY TRACKING DEMODULATOR
D. F. G. Durao and J. H. Whitelaw Mar. 1974 26 p refs
(HTS/74/11) Avail: NTIS HC $4.50

Tests were carried out to quantify the linearity, electronic noise level, tracking rate, and frequency response of a prototype DISA frequency tracking demodulator. The required input signals simulated velocity variations corresponding to sine waves and random signals: the output from a hot-wire anemometer was also used as the basis for an input signal which had the characteristics of a continuous Doppler signal from a turbulent flow. The prototype DISA tracker is similar to the commercially available instrument (DISA Model 55L20) but allowed the tracking loop to be tested without the preamplifier contained in the latter. Comments on the performance of the commercially-available instrument with real Doppler signals and finite drop-out are provided on the basis of previous experimental experience. Author

N74-32679# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE EFFECT OF PHASE ERROR ON THE DPSK RECEIVER PERFORMANCE
D. A. Shnidman 4 Feb. 1974 28 p refs
(Contract DOT-FA72WAI-261)
(AD-774675; ATC-32; FAA-RD-74-21) Avail: NTIS HC $4.50

Several methods of realizing a DPSK receiver use a delay line. Temperature variations cause changes in the delay which, in turn, cause errors in the phase differences between the reference and information signals. The effect of these errors on the performance of an optimum DPSK receiver is studied in this report. Author

N74-32680*# Avco Government Products Group, Lowell, Mass.
MODULAR, HIGH POWER, VARIABLE R DYNAMIC ELECTRICAL LOAD SIMULATOR Final Report, 28 Jun. 1973 - 20 Jun. 1974
K. P. Joncas 24 Jun. 1974 61 p refs
(Contract NAS9-13495)
(NASA-CR-134392; AVSD-0170-74-RR) Avail: NTIS HC $6.25 CSCL 09C

The design of a previously developed basic variable R load simulator was entended to increase its power dissipation and transient handling capabilities. The delivered units satisfy all design requirements, and provides for a high power, modular simulation capability uniquely suited to the simulation of complex load responses. In addition to presenting conclusions and recommendations and pertinent background information, the report covers program accomplishments; describes the simulator basic circuits, transfer characteristic, protective features, assembly, and specifications; indicates the results of simulator evaluation, including burn-in and acceptance testing; provides acceptance test data; and summarizes the monthly progress reports. Author

N74-32681# Royal Aircraft Establishment, Farnborough (England).
VERY HIGH VOLTAGE POWER SUPPLY (2500 V, 500 W)
J. D. Lemoine May 1974 13 p Transl. into ENGLISH from Alimentation Tres Haute Tension de Puissance: 2500 V, 500 W Presented at LAAS Conf. on Electric Propulsion in its Space Appl., Toulouse, 1972
(RAE-Lib-Trans-1772; BR42101) Avail: NTIS HC $4.00

A high voltage power supply (2500V,500W) suitable for an ion thruster is described. The general considerations of the objectives of the study are followed by a description of the circuits and the results obtained on a breadboard. Author

N74-32682# Brookhaven National Lab., Upton, N.Y.
REVIEW OF BROOKHAVEN NATIONAL LABORATORY SUPERCONDUCTING POWER TRANSMISSION PROGRAM
J. E. Jensen 11 Oct. 1973 12 p Sponsored by AEC
(BNL-18346) Avail: NTIS HC $3.00

Research is being conducted to develop a superconducting ac cable system leading to the construction of a 1/2 mile model cable of 200 MVA capacity and a cable of large capacity for tests at a utility testing site. It is a coaxial cable of flexible design using Nb3Sn superconductor and a tape wound dielectric, helium impregnated, of a material yet to be determined. The research development is reported on the dielectric materials, cryogenic enclosure, refrigeration, and superconducting materials. NSA

N74-32683# Los Alamos Scientific Lab., N.Mex.
USAEC-DAT DC SUPERCONDUCTING POWER TRANSMISSION LINE PROJECT AT LASL Progress Report, 1 Jul. - 30 Sep. 1973
W. E. Keller, comp. and R. D. Taylor, comp. Nov. 1973 28 p refs
(Contract W-7405-eng-36)
(LA-5468-PR) Avail: NTIS HC $4.00

The principal findings of two study contracts on feasibility and costs involved in building a commercial SPTL are summarized. Experimental critical current results for Nb3Sn tapes in several geometries and numerical calculations of the magnetic field profile assuming various models of the current distribution are presented. Continued progress in the areas of fabrication, superconducting materials, and test bed operation is reported. Author (NSA)

N74-32684# Los Alamos Scientific Lab., N.Mex.
DEVELOPMENT PROJECT FOR A dc SUPERCONDUCTING POWER TRANSMISSION LINE
T. E. McDonald 1973 8 p refs Presented at Underground Transmission and Distribution Conf., Dallas, Apr. 1974 Sponsored by AEC
(LA-UR-73-1500; Conf-740410-1) Avail: NTIS HC $4.00

A dc superconducting power transmission project that is in progress at the Los Alamos Scientific Laboratory is described. The project is directed toward the development of a system that would primarily be used for long distance high capacity transmission. A discussion of the advantages of a dc superconducting transmission line is given and preliminary cost estimates of a conceptual design are presented. Author (NSA)

N74-32685# Bendix Corp., Kansas City, Mo.
SOLID STATE CIRCUIT BREAKER Technological Spinoff Report
E. R. Elmer Feb. 1974 28 p refs
(Contract AT(29-1)-613)
(BDX-613-1062) Avail: NTIS HC $4.50

A solid state circuit breaker was designed using the SCEPTRE circuit analysis program. The experimental circuit assembled worked satisfactorily for overloads up to 200 percent. This device would be useful in some special applications where fast operation in the microsecond range would be an advantage. Author (NSA)

N74-32686# European Space Research Organization, Paris (France).
THE SIGNIFICANCE OF STRENGTH FOR THE RELIABILITY OF SOLDER JOINTS IN ELECTRONICS
Rudolf Gohle (DFVLR, Oberpfaffenhofen, West Ger.) May 1974 79 p refs Transl. into ENGLISH of Die Bedeutung der Festigkeit fuer die zuverlaessigkeit von Loetstellen der Elektronik, DLR-FB-73-33, DFVLR, 9 Feb. 1973
(ESRO-TT-58; DLR-FB-73-33) Avail: NTIS HC $7.00; DFVLR, Porz, West Ger. 25.20 DM

The constancy of electrical resistance of soldered joints was investigated. Special attention was given to the effects of temperature, pressure, alloying additions, structure, and magnetic fields. The elastic and plastic behavior of the metals used are discussed. ESRO

N74-32687# IBM Watson Research Center, Yorktown Heights, N.Y.
MAGNETIZATION SWITCHING IN A MAGNETO-OPTIC THIN FILM Quarterly Technical Report, 1 Nov. - 31 Dec. 1973
James M. White and S. C. Tseng Jun. 1974 25 p refs
(Contract N00014-73-C-0256; ARPA Order 2327)
(AD-780703; QTR-4) Avail: NTIS CSCL 09/1

An improved technique for observing sub-nanosecond magnetization changes in thin films has been used to study the underdamped oscillatory behavior in a (Y(2.5)Gd(.5)(Fe4Ga1)O12 sample. The measurement set-up uses a version of the alternate sampling technique in which the sensitivity has been upgraded by the use of a lock-in amplifier. By using a shorted strip-line of appropriate length to apply to the film two properly timed magnetic field steps, the precession of the magnetization can be quelled, and the magnetization can be switched between initial and final directions in a half-cycle of the resonant frequency. Author (GRA)

N74-32688# General Electric Co., Syracuse, N.Y. Heavy Military Electronic Systems.
LOW-VOLUME HIGH-POWER RADIATING TRANSMITTER Final Report, 17 Jan. 1973 - 17 Jan. 1974
G. F. Farrell, Jr., S. K. Altes, and A. A. Schill Apr. 1974 92 p refs
(Contract F30602-73-C-0092)
(AD-781108; RADC-TR-74-87) Avail: NTIS CSCL 09/5

Discussed in detail are: Element impedance values in a densely packed array, performance of a 512-element array, and a high-power plug-in module. Questions concerning the effect of E- and H-plane scanning on array performance are answered. The results of array performance with respect to radiation patterns, gain and beam steering are also presented. Author (GRA)

N74-32689# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONSTRUCTION ALGORITHMS OF THE CONTROL CIRCUITS OF CONVERTER UNITS USING PULSE-POSITION MULTI-STABLE ELEMENTS
V. P. Grafov, G. N. Elizarenko, V. D. Kolomiets, and A. S. Tolstoukhov 17 Jun. 1974 10 p Transl. into ENGLISH from the monograph "Mnogoustoichivye Elementy i ikh Primenenie, Sbornik Statei" 1971 p 308-314
(AD-781149; FTD-HT-23-1024-74) Avail: NTIS CSCL 09/5

The control system of converter units must ensure the asymmetric control of semiconductor devices in order to improve the energy characteristics and also to provide control and synthetization of the output voltage. The conversion of information, obtained from sensors in the form of a continuous signal, serves as the basis for inverter control. An important problem is the algorithmization of control circuits based on pulse-position multistable elements used in conjunction with a phase splitter on flip-flops with a diode matrix in the feedback circuit, which makes it possible to solve the most complex problems of asymmetric control. Author

N74-32690# Hamilton Standard, Windsor Locks, Conn.
INFRARED TESTING OF MULTI-LAYER BOARDS Final Report, 26 Sep. 1973 - 12 Jan. 1974
Ralph W. Woodgate Apr. 1974 45 p
(Contract F30602-74-C-0024)
(AD-780550; RADC-TR-74-88) Avail: NTIS CSCL 09/5

Calculations show that quickly heating the pad surface of a plated through hole in a multi-layer printed circuit board, and plotting the time/temperature curve as the heat flows into the

hole structure, will indicate the quality of the plated through hole. Limitations exist as to the degree of disconnect and the number of layers that can be tested. Experiment suggests the validity of the calculations, but shows up problems in the practical usage of the system, in particular the selection and production of effective emissivity standardization coatings. Author (GRA)

N74-32691# Clarkson Coll. of Technology, Potsdam, N.Y.
TRANSIENT TEMPERATURE RISE IN FILM RESISTORS
Henry Domingos Apr. 1974 33 p refs
(Contract F30602-72-C-0463)
(AD-781125; RADC-TR-74-92) Avail: NTIS CSCL 09/1

Transient temperature distributions in film resistors are calculated for time intervals ranging from 10 nsec to 100 microsec. A one-dimensional model consisting of substrate, resistive film, and jacket is assumed. Peak temperatures are plotted for various film thicknesses, using thermal properties appropriate for resistors from four manufacturers. Author (GRA)

N74-32692# Polytechnic Inst. of Brooklyn, N.Y.
GENERATION OF ULTRA-HIGH POWER ELECTRICAL PULSES Final Report, 1 Dec. 1972 - 30 Nov. 1973
L. Birenbaum and E. Levi May 1974 87 p refs
(Contract F30602-73-C-0053; AF Proj. 4506)
(AD-781114; RADC-TR-74-119) Avail: NTIS CSCL 09/5

The report is a comprehensive assessment of the state-of-the-art of various energy conversion techniques involving high power electrical pulse generation. The subjects treated include rotating machines, explosive devices, superconductivity, switching, and plasma techniques, including the supercritical temperature and pressure regions. Author (GRA)

N74-32693# Lincoln Lab., Mass. Inst. of Tech., Lexington.
INTEGRATED OPTICAL CIRCUITS Semiannual Technical Summary, 1 Jul. - 31 Dec. 1973
Charles M. Wolfe, Gregory E. Stillman, David L. Spears, and Ivars Melngailis 31 Dec. 1973 30 p refs
(Contract F19628-73-C-0002)
(AD-781102; ESD-TR-74-172) Avail: NTIS CSCL 09/1

In(x)Ga(1-x)As avalanche photodiodes have been integrated into GaAs waveguide structures by selective epitaxial deposition. Measurements of the ionization coefficients of electrons (alpha) and holes (beta) have been made for GaAs by using a special type of GaAs Schottky barrier avalanche photodiode structure. A new type of GaAs avalanche photodiode which has considerable advantages for detection at wavelengths up to 0.93 micrometer has been investigated. Significant progress has been made in the vapor epitaxial growth of Hg(1-x)Cd(x)Te on CdTe substrates by H2 transport. High-energy proton bombardment has been used to fabricate waveguides for 10.6 micrometer in CdTe. Coupling of 10.6 micrometer radiation into CdTe waveguides has been explored. The feasibility of integrated surface acoustic wave modulators for 10.6 micrometer has been investigated. (Modified author abstract) GRA

N74-32694# Army Missile Command, Redstone Arsenal, Ala.
INDUCTANCES OF FOLDED FOIL CONFIGURATIONS
J. Darryl Holder Apr. 1974 15 p
(AD-780714; RG-74-8) Avail: NTIS CSCL 09/1

The purpose of the work was to explore the methods for construction of low-inductance exploding foil packages. The conducting media was 0.001-inch aluminum foil and was folded accordian-pleat fashion with dielectric sheets interleaved to produce a compact switch package that may be placed between the conductors of a parallel-plate transmission line. The results of this study shown good fit of measured foil package inductances with the expected behavior and imply that it is indeed possible to use foils of long length in low-inductance circuits.
Author (GRA)

N74-32695# Admiralty Surface Weapons Establishment, Portsmouth (England).
RADOME MOUNTED POLARISING GRIDS
A. C. Large Dec. 1973 12 p refs
(AD-780564; ASWE-TR-73-32; BR39869) Avail: NTIS CSCL 09/5

Polarizing grids supported on the surfaces of an A sandwich radome structure are described. Grids consisting of two and four wire layers have been tested and shown capable of changing the polarized direction of the radiated field from an X band antenna by 45 degrees and 90 degrees respectively. A radome mounted grid capable of providing a continuous adjustment of polarization direction over a limited angular range is also described. Author (GRA)

N74-32696# Stanford Research Inst., Menlo Park, Calif.
LEAKAGE THROUGH CABLE CONNECTIONS Final Report, 10 May - 30 Oct. 1973
E. F. Vance and S. Dairiki May 1974 36 p refs
(Contract F29601-69-C-0127; AF Proj. 3763)
(AD-779936; AFWL-TR-74-44) Avail: NTIS CSCL 09/1

A qualitative model of shielded connectors for multiconductor cables is described. The model contains a series resistance across the connector and iris coupling through cracks or slits in the connector. The connector model is applied to a matrix description of a multiconductor transmission line. The results of transfer-impedance measurements on six cable connectors are described and interpreted. Author (GRA)

N74-32697# Raytheon Co., Waltham, Mass. Research Div.
LIFE AND RELIABILITY OF EBS DIODES Final Technical Report
J. Simpson, J. Osepchuk, R. Bierig, and G. DeMars Jul. 1974 71 p refs
(Contract N00039-73-C-0051)
(AD-781741; S-1690) Avail: NTIS

The report describes a program to investigate the life and reliability of two types of electron-beam-semiconductor (EBS) diodes with the objective of demonstrating a 2500 hour life. One is large (approximately 1 cm diameter) and is suitable for high average power, low frequency amplifiers. The other is small (0.20 inch diameter) and can provide amplification up to 4.6 GHz. These diodes represent the extremes of the largest and smallest EBS diodes reported in the industry. GRA

N74-32698# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
AN ULTRA-LOW-NOISE PREAMPLIFIER USING SUPERCONDUCTING QUANTUM DEVICES
A. Davidson, R. S. Newbower, and M. R. Beasley Apr. 1974 39 p refs
(Contracts N00014-67-A-0298-0022; N00014-67-A-0298-0006; N00014-67-A-029-8-0031; Grant NSF GH-34133; NR Proj. 018-407)
(AD-781281; TR-7) Avail: NTIS CSCL 14/2

The application of superconducting (SQUID) galvanometers as low-noise preamplifiers with considerable bandwidth is explored. The important role of negative feedback in maximizing the bandwidth of these preamplifiers is carefully analyzed. Also discussed is the design and construction of superconducting impedance matching transformers suitable for making the unexcelled noise characteristics of these amplifiers available over a wide range of source impedances. A working preamplifier is described which has exhibited a maximum bandwidth of 10 k Hz and noise temperatures in the liquid helium temperature range or below for all source impedances up to a few ohms. The operating characteristics of this preamplifier are compared to the best conventional room temperature amplifiers and are found to be superior for source impedances less than approximately 10 ohms. Author (GRA)

N74-32699# Naval Postgraduate School, Monterey, Calif.
THE THERMAL PERFORMANCE OF AIR-COOLED CIRCUIT BOARDS USED IN STANDARD ELECTRONIC PACKAGE DESIGNS Final Report
Paul J. Marto and Matthew D. Kelleher 20 May 1974 47 p refs
(AD-781365; NPS-59MX74051) Avail: NTIS CSCL 09/5

A test section was designed and constructed to model air-cooled printed circuit boards containing integrated circuit components as proposed for Naval standard package designs. Thermal performance data are presented for air flow rates to 3.38 CFM across fiberglass/epoxy and aluminum core circuit boards, each containing nine resistor elements to simulate IC components. Hot spot areas on the boards are shown using both liquid crystals and thermocouple data. Results show that

in designing such standard packages, care must be taken to avoid obstructions in the air flow path. These obstructions can cause poorly circulating flow regions near the circuit boards, leading to hot spots and poor thermal performance of the IC components. The use of an aluminum core circuit board can significantly reduce this hot spot problem. Author (GRA)

N74-32700# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
A THEORETICAL AND EXPERIMENTAL INVESTIGATION OF COMBINATIONS OF SLOT AND LINEAR ANTENNAS
Stuart A. Long Feb. 1974 59 p refs
(Contract F19628-74-C-0060; AF Proj. 5635)
(AD-781781; AFCRL-TR-74-0203; SR-2) Avail: NTIS CSCL 09/5

The combination of a linear antenna and a slot antenna can be used to provide a relatively isotropic radiation pattern when the dipole is perpendicular to the plane of the slot. The theoretical far field radiation pattern of a dipole flanked by a two-element array of slot antennas is formulated. The fields for a variety of relative phasings between the elements of the combination antenna are calculated and the degree of approximation to an isotropic source in the sense of the total field noted. An experimental antenna was fabricated and the radiated fields measured with good agreement found with the theoretical formulas. Author (GRA)

N74-32701# Army Missile Command, Redstone Arsenal, Ala. Directorate for Product Assurance.
INVESTIGATION OF A CLASS-B AMPLIFIER FOR REACTIVE LOADS
William Y. Bishop Jun. 1974 67 p refs
(AD-781478) Avail: NTIS CSCL 09/5

The objective of the study was to determine the significance of reactive loading on a Class-B push-pull power amplifier. The load line is derived and shown to be an ellipse for all load phase angles except zero. The relationship between the elliptical load line and the transistor manufacturer's maximum ratings is explained. Power dissipation and efficiency quantities are derived, and a qualitative analysis of amplitude distortion is presented. Pertinent experimental results are compared with the theoretical predictions, and it is concluded that the derived equations for the load line and power relationships agree quite closely with the experimental results. Author (GRA)

N74-32702# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CHARACTERISTICS OF SiO2 FILMS GROWN IN AN HcL PURGED ENVIRONMENT M.S. Thesis
Richard Randol Hoffmeister Jun. 1974 114 p refs
(AF Proj. 6096)
(AD-781832; GE/EE/74-26) Avail: NTIS CSCL 09/1

The major purpose of the research is to study how the addition of HCl affects the characteristics of oxides typically used in integrated circuit manufacture. HCl was used in two ways: an HCl/O2 mixture was used to clean the oxidation tube prior to oxidation, and an HCl/O2 mixture was used in an in situ process. The oxide parameters having a significant impact on device performance were identified and measured by using both C-V and I-V techniques. An HCl distribution system was constructed and used with a conventional oxidation furnace. Negligible trapping of sodium ions at the Si-SiO2 interface was observed for oxides grown in an HCl cleaned tube and conventional oxides, while strong trapping of the ions was observed when HCl was used in situ. (Modified author abstract) GRA

N74-32703# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ADVANCED ELECTRONIC TECHNOLOGY Quarterly Technical Summary, 1 Feb. - 30 Apr. 1974
Melvin A. Herlin and Alan L. McWhorter 15 May 1974 22 p
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-781380; ESD-TR-74-209) Avail: NTIS CSCL 09/1

The document contains reports in integrated circuit development, speech processors, computer systems, solid state device research, quantum electronics, materials research, physics of solids, and microelectronics. GRA

N74-32704# Hercules Powder Co., Magna, Utah. Bacchus Works.
PEAK FOLLOWER CIRCUIT PROGRAM Final Report, 1 Jun. 1973 - 30 Mar. 1974
D. U. Bennion Apr. 1974 76 p
(Contract F04611-73-C-0065)
(AD-781819; AFRPL-TR-74-14) Avail: NTIS CSCL 21/2

An electronic peak follower circuit (PFC) was developed, and a filter design was analyzed and simulated by an analog and digital computer. A commercially manufactured filter, which closely met the desired filter characteristics, was selected and procured. The combination of the Hercules developed circuit and the purchased filter, which comprise the PFC, were characterized through the use of an analog computer. Comparisons of PFC-reduced data against hand-reduced data were made for 20 hot T-burner firings and for 20 firings previously conducted and recorded on FM tape. GRA

N74-32705# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
A STUDY OF LOADED ANTENNAS FOR REMOTE SENSING APPLICATIONS
G. C. Rose, R. S. Vickers, and R. J. Churchill Sep. 1973 119 p refs
(Contract F19628-70-C-0035; AF Proj. 7260)
(AD-781388; AFCRL-TR-73-0642; SR-8) Avail: NTIS CSCL 09/5

The radiation of transient signals is studied to determine what conditions antennas must satisfy to minimize the distortion contributed by the antenna. The conditions suggest the use of V configured traveling wave antennas which appear to satisfy to a large degree the conditions necessary for good transient performance. Studied in particular are a cylindrical antenna with tapered resistive loading to achieve an outward traveling wave current distribution, and a new antenna consisting a high-conductivity cylinder terminated by a resistively loaded end-section. The current distribution, input admittance, and the terminal voltage for an impulsive incident field are calculated numerically for these antennas and the numerical results are verified experimentally. (Modified author abstract) GRA

N74-32706# Michigan Univ., Ann Arbor. Electron Physics Lab.
THEORETICAL AND EXPERIMENTAL STUDIES OF THE TUNING AND MODULATION PROPERTIES OF TRANSFERRED-ELECTRON DEVICES Ph.D. Thesis
D. D. Tang May 1974 253 p refs
(Contract F30602-74-C-0012; AF Proj. 5573)
(AD-781389; TR-130; RADC-TR-74-101) Avail: NTIS CSCL 09/1

The purpose of the study is to investigate the tuning and modulation properties of transferred-electron devices. The device performance under two basic tuning methods was examined: tuning through the bias voltage of the device and tuning through a resonant circuit. The tuning properties were derived from the interaction between the device and the circuit. Thus, both the device and the circuit admittances are needed for the investigation. Two conventional cavity circuits which were employed in these investigations, namely, the post-mount waveguide cavity and the slug-tuned coaxial-line cavity, had already been modeled and well understood. This study, therefore, concentrated on the nonlinear properties of the transferred-electron device. Author (GRA)

N74-32707# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Electrical Engineering and Electrophysics.
INTEGRATED CIRCUIT RELIABILITY PREDICTION AND COMPLEXITY MODELS
Henry R. Goldenberg Jun. 1973 128 p refs
(Contract N00014-67-A-0438-0013; NR Proj. 042-301)
(AD-781330; PINY-EE/EP-74-004; PINY-EER-103) Avail: NTIS CSCL 09/5

A method for calculating the average hazard rate for a catastrophic failure test using the test duration, the number of failures, and the sample population, is shown. If the number of failures is much less than the sample population, the failure rate can be approximated by the number of failures divided by the product of the sample population and the test duration. A

equivalency criterion is developed that allows a transformation between hazard model shapes. The model shapes examined in detail are the constant, the Weibull, and the piecewise linear shapes. It is shown that significant errors in reliability can result from assuming a constant hazard. The principal failure modes of digital integrated circuits are examined, and they are related to the complexity of the circuit by qualitative arguments. The analysis is performed for the TTL 7400 series and the Schottky 74S00 series. It is shown that the hazard function of the integrated circuits is a Weibull function of time with a scale parameter proportional to the number of gates in the devices. (Modified author abstract) GRA

N74-32708# Army Electronics Technology and Devices Lab., Fort Monmouth, N.J.
ON THE INTERACTION BETWEEN TWO COUPLED COHERENT OSCILLATORS
Gerald J. Iafrate and Mark Croft Jun. 1974 29 p refs
(DA Proj. 1T1-61102-B11-A)
(AD-781503; ECOM-4227) CSCL 20/10

The quantum dynamics for two coupled harmonic oscillators is presented. Using the coupled Boson representation, the assumed problem is shown to be isomorphic with a perturbed angular momentum oscillator. The current operator is obtained and its associated expectation values with respect to the number states, coherent states (Glauber states) and atomic coherent states are given. In the limit of weak coupling the results obtained using the coherent states are shown to manifest a Josephson phase relationship. Author (GRA)

N74-32709# Microwave Associates, Inc., Burlington, Mass.
RELIABILITY OF HIGH FIELD SEMICONDUCTOR DEVICES Final Report, 1 Apr. 1973 - 31 Jan. 1974
T. B. Ramachandran and J. L. Heaton Feb. 1974 102 p refs
(Contract DAAB07-72-C-0101)
(AD-781572; ECOM-0101-F-72) Avail: NTIS CSCL 09/1

The report describes the results of a program of investigation concerning the reliability and failure modes of gallium arsenide Gunn and IMPATT diodes. Data is presented concerning the burn-out distribution in time of Gunn diodes. Also, the changes in dc and RF parameters of 700 Gunn and 100 gallium arsenide IMPATT diodes resulting from 24 to 168 hours of dc high temperature burn-in are present. The results of long-term RF burn-in experiments are presented. Optical and electron microscope photographs are presented which are used in the analysis of the manufacturing defects leading to early failure in Gunn diodes. Correction of these defects has lead to an increased 24-hour burn-in yield. (Modified author abstract) GRA

N74-32710# General Electric Co., Syracuse, N.Y. Semiconductor Products Dept.
LOW COST TRANSIENT SUPPRESSOR Final Report, 1 May - 21 Nov. 1973
Thomas D. Donovan and Robert I. Scace Jun. 1974 46 p refs
(Contract DAAB07-73-C-0168; DA Proj. 1S7-62705-AH-94)
(AD-781570; ECOM-0168-73-F) Avail: NTIS CSCL 09/1

The objective was to develop models of a low cost metal-oxide varistor for use as a transient suppression device for vehicular installed tactical radios. The emphasis was on electrical and thermal characteristics for transient suppression. GRA

N74-33190 Ecole Superieure de Chimie, Mulhouse (France). Lab. de Chimie Minerale Appliquee.
VAPOR-PRESSURES ABOVE STRONTIUM-CESIUM ALLOYS
C. Oberlin and P. Strobel *In* DFVLR Surface Phenomena in Thermionic Res. 16 Aug. 1973 p 129-140 refs (For availability see N74-33181 22-26)

N74-33403* General Electric Co., Philadelphia, Pa.
SPACE MANUFACTURING OF SURFACE ACOUSTIC WAVE DEVICES, APPENDIX D
G. Sardella *In its* Study for Identification of Beneficial Uses of Space (BUS), Phase 2, Vol. 2, Book 2, Sect. 5 1 Nov. 1973 20 p refs (For availability see N74-33399 22-34)
CSCL 09E

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N74-32711* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PULSE STRETCHER FOR NARROW PULSES Patent
Reed S. Lindsey, Jr., inventor (to NASA) (Lockheed Electron. Co., Houston, Tex.) Issued 20 Aug. 1974 20 p Filed 25 Jun. 1973 Supersedes N73-26232 (11 - 17, p 2007) Sponsored by NASA
(NASA-Case-MSC-14130-1; US-Patent-3,831,098; US-Patent-Appl-SN-373587; US-Patent-Class-328-58; US-Patent-Class-307-267) Avail: US Patent Office CSCL 09C

A pulse stretcher for narrow pulses is presented. The stretcher is composed of an analog section for processing each arriving analog pulse and a digital section with logic for providing command signals to the gates and switches in the analog section.
Official Gazette of the U.S. Patent Office

N74-32712* National Aeronautics and Space Administration. Pasadena Office, Calif.
CAPACITANCE MULTIPLIER AND FILTER SYNTHESIZING NETWORK Patent
Arthur J. Kline, inventor (to NASA) (Motorola, Inc., Scottsdale, Ariz.) Issued 20 Aug. 1974 21 p Filed 15 Nov. 1972 Supersedes N73-15255 (11 - 06, p 0647) Sponsored by NASA
(NASA-Case-NPO-11948-1; US-Patent-3,831,117; US-Patent-Appl-SN-306652; US-Patent-Class-333-80R; US-Patent-Class-330-69; US-Patent-Class-307-230) Avail: US Patent Office CSCL 09C

A circuit using a differential amplifier multiplies the capacitance of a discrete interating capacitor by (r sub 1 + R sub 2)/R sub 2, where R sub 1 and R sub 2 are values of discrete resistor coupling an input signal e sub 1 of the amplifier inputs. The output e sub 0 of the amplifier is fed back and added to the signal coupled by the resistor R sub 2 to the amplifier through a resistor of value R sub 1. A discrete resistor R sub x may be connected in series for a lag filter, and a discrete resistor may be connected in series with the capacitor for a lead-lag filter. Voltage dividing resistors R sub a and R sub b may be included in the feedback circuit of the amplifier output e sub o to independently adjust the circuit gain e sub i/e sub o.
Official Gazette of the U.S. Patent Office

N74-32713 Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
NEW TECHNOLOGIES TOWARDS NEW STEPS IN MICROMINIATURIZATION (NANOELECTRONICS) Final Report [ETUDE DE NOUVELLES TECHNOLOGIES PERMETTANT DE FRANCHIR UNE NOUVELLE ETAPE DE LA MICROMINIATURISATION (NANOELECTRONIQUE)]
O. Cahen Jun. 1973 188 p refs In FRENCH
(Contract DGRST-72-7-0546)
Avail: Issuing Activity

The technologies required for further development in integrated circuit microminiaturization are presented. They involve electronic masking, triode cathodic deposition, ion engraving, and ion implantation. Improvements to the electronic masking instrument are detailed in a user manual. The characteristics of an electronic mask replicator are described and the construction phases are outlined. Characterization of resists for high resolution work was performed taking into consideration positive and negative resists. Ion implantation characterization is discussed together with ion engraving technology. Integrated circuits were made using the techniques to test the transfer to industrial application. ESRO

N74-32714*# Kanner (Leo) Associates, Redwood City, Calif.
ACCURATE MATHEMATICAL MODELLING OF PWM POWER REGULATORS: PARTIAL REPORT
R. Prajoux, J. C. Marpinard, and J. Jalade Washington NASA Sep. 1974 33 p refs Transl. into ENGLISH of Lab. d'Automatique

et d'Analyse des Systemes, C.N.R.S. Report, May 1974
(Contract NASw-2481)
(NASA-TT-F-15947) Avail: NTIS HC $4.75 CSCL 09C

A method is described which makes it possible to put the dynamic behavior of PWM converters into equation form, and to determine their pulsed transmittance for any given structure or mode of operation. Simplifications for practical application of the method are performed a posteriori to clarify their range. Author

N74-32715*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TECHNOLOGY EVALUATION OF CONTROL/MONITORING SYSTEMS FOR MIUS APPLICATION
L. Marion Pringle, Jr. Aug. 1974 65 p
(NASA-TM-X-58135; JSC-08973) Avail: NTIS HC $3.75 CSCL 09C

Potential ways of providing control and monitoring for the Modular Integrated Utility System (MIUS) program are elaborated. Control and monitoring hardware and operational systems are described. The requirements for the MIUS program and the development requirements are discussed. Author

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N74-32716# Aeronautical Research Labs., Melbourne (Australia).
A COMPACT SHOCK TUBE GENERATOR OF WEAK TRIANGULAR PRESSURE PULSES
A. S. Kaye Dec. 1973 24 p refs
(ARL/A-Note-343) Avail: NTIS HC $4.25

The development and performance of a shock tube device for the generation of weak, triangular pressure pulses of short risetime are described. The device, which comprises a straight, diaphragm bursting shock tube with a conical extension was developed to calibrate pressure transducers. It is significantly smaller than the simple conical shock tube required to produce an equivalent pulse, but it does not generate a full N-wave. Although the peak overpressures measured in this device are close to those predicted for a simple conical shock tube of the same angle and diaphragm diameter, the falltimes observed in the former are larger by a factor of 3.5 at low overpressures. The falltime is shown to be a simple function of a derived similarity parameter which is in turn, a function of the cone angle and inlet diameter with a simple correction factor accounting for the effects of finite overpressure. The peak overpressures at a given station are reproducible to within plus or minus 2%, but by using a reference pressure transducer, cross-calibration of transducers can be made to within plus or minus 1%. The device has been successfully used for this purpose. Author

N74-32717# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
THE TOTAL TEMPERATURE IN THE LONGSHOT WIND TUNNEL; ITS MEASUREMENT AND EVALUATION
Edgard Backx Apr. 1974 81 p refs Sponsored in part by Natl. Fonds voor Wetenschappelijk Onderzoek
(Grant AF-AFOSR-2227-72)
(VKI-TN-98) Avail: NTIS HC $7.25

The stagnation temperature of the flow in the Longshot tunnel operating at four standard conditions was measured using four different techniques. The temperature in the supply reservoir is measured using a thermocouple. A thermocouple with a heated shield and a fine wire technique are used in the test section. Finally the stagnation temperature is inferred from the measurements of stagnation point heat transfer. Corrections for heat losses are described. The results from the different methods are compared and their interpretation leads to a better understanding of the suitability of each method. The results provide good reference values for the standard tunnel conditions. Author

N74-32718*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
VEHICLE SIMULATOR BINOCULAR MULTIPLANAR VISUAL DISPLAY SYSTEM Patent Application
Wendell D. Chase, inventor (to NASA) Filed 13 Sep. 1974 20 p
(NASA-Case-ARC-10808-1; US-Patent-Appl-SN-505881) Avail: NTIS HC $4.00 CSCL 14B

An aircraft simulator is described for affording practice in landing maneuvers and the like. A cathode ray tube (CRT) produces an image corresponding to the runway which image changes in response to the trainee's manipulation of controls. The CRT image is projected along an optical path to a screen that is visually accessible to the trainee. Interposed in the optical path are optical elements such as mirrors which are spaced from one another along the optical path so as to create virtual images on the screen that appear to be at different distances from the trainee. The optical elements are sequentially interposed in the path. Means are provided for synchronizing the production of the CRT image with one of the optical elements so that the image on the screen appears to the trainee to have a range corresponding to the environment being simulated by the CRT image. NASA

N74-32719*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEUTERIUM PASS THROUGH TARGET Patent Application
Donald L. Alger, inventor (to NASA) Filed 27 Aug. 1974 20 p
(NASA-Case-LEW-11866-1; US-Patent-Appl-SN-500980) Avail: NTIS HC $4.00 CSCL 14B

A neutron emitting target is used for neutron generating. A deuteron source and an accelerator vacuum chamber comprise a tritium-containing target layer, a deuteron accumulation layer, and a target support containing passages providing communication between the accumulation layer and portions of the surface. With this arrangement, deuterons passing through the target layer and impianting in and diffusing through the accumulation layer, diffuse into the communication passages and are returned to the accelerator vacuum chamber. NASA

N74-32720*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif. Space Sciences Dept.
ZERO-GRAVITY CLOUD PHYSICS LABORATORY: EXPERIMENT PROGRAM DEFINITION AND PRELIMINARY LABORATORY CONCEPT STUDIES Final Report
L. R. Eaton and E. V. Greco Sep. 1973 328 p refs
(Contract NAS8-27861)
(NASA-CR-129013) Avail: NTIS HC $19.50 CSCL 14B

The experiment program definition and preliminary laboratory concept studies on the zero G cloud physics laboratory are reported. This program involves the definition and development of an atmospheric cloud physics laboratory and the selection and delineations of a set of candidate experiments that must utilize the unique environment of zero gravity or near zero gravity. Author

N74-32721# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
SHOCK TUBE OPERATION USING A COMPRESSION-HEATED DRIVER GAS
Richard C. Jenkins Aug. 1974 67 p refs
(RE-481) Avail: NTIS HC $6.50

A high energy shock tube has been developed that employs free-piston compression to energize the driver gas. The shock tube may be operated in either a constant volume or a constant pressure mode, depending upon whether or not the piston is brought to rest prior to diaphragm rupture. The constant volume mode was used to produce shock velocities up to 30,000 feet per second in helium and argon. The constant pressure mode was used to obtain tailored interface operation with helium driving argon at shock Mach numbers around 10. Analyses were developed for predicting piston behavior and shock tube operating characteristics in both modes. The results of these predictions are compared with our measurements. The shock tube performance calculations reveal some advantages of the constant pressure code for tailored interface shock tube operation. Author

ance calculations reveal some advantages of the constant pressure mode for tailored interface shock tube operation. Author

N74-32722*# Kanner (Leo) Associates, Redwood City, Calif.
DESCRIPTION OF ACOUSTICAL INSTALLATIONS OF THE CENTER FOR TESTING OF PROPULSION SYSTEMS
J. Bongrand Washington NASA Sep. 1974 9 p Transl. into ENGLISH of "Description des Installations Acoustiques du C.E.Pr.", Rept. 55/ZDL/74 Centre d'Essais des Propulseurs, Saclay, Fr., 30 Apr. 1974 p 7
(Contract NASw-2481)
(NASA-TT-F-15922; Rept-55/ZDL/74) Avail: NTIS HC $4.00 CSCL 14B

The soundproofing, air circulation system and measurement device of the A17 anechoic chamber are described, as is the data processing system for measurements obtained in the chamber. An anechoic wind tunnel soon to be constructed will have similar characteristics to those of the anechoic chamber, but with improved capacity for simulation of real conditions. Author

N74-32723*# Kanner (Leo) Associates, Redwood City, Calif.
ACOUSTICAL TESTS AT THE CENTER FOR TESTING OF PROPULSION SYSTEMS
J. Bongrand Washington NASA Sep. 1974 6 p Transl. into ENGLISH of "Essais Acoustiques au C.E.Pr.", Rept. 78/ZDL/74 Centre d'Essais des Propulseurs, Saclay, Fr., 9 Aug. 1974
(Contract NASw-2481)
(NASA-TT-F-15938; Rept-78/ZDL/74) Avail: NTIS HC $4.00 CSCL 14B

Tests are described which are performed in the A17 anechoic chamber. Measurement of the sound field and frequency spectra, comparison of sound levels and other physical parameters representative of turbulence, analysis of the efficiency of several types of noise suppressors, and use of specialized methods to pinpoint sound sources within the jet are included. Author

N74-32724# California Univ., Richmond.
CHARACTERISTICS OF FOG PRODUCED IN THE FAA-UC FOG CHAMBER
Paula Higino, D. M. Finch, and Don O. Horning Jan. 1973 91 p refs
(Contract DOT-ARDS-434)
(AD-773418; FAA-RD-73-176; ARDS-434) Avail: NTIS HC $7.75

Studies were conducted of the limitations and capabilities of a fog chamber to provide an environment suitable for aviation weather visibility experimentation. Fog stability, particle size and particle distribution in the fog chamber were measured. Special techniques were developed to permit measurements of virtually undisturbed fog particles down to approximately 8 microns diameter. Data are presented for measurements of fog stability under various conditions of ambient temperature, humidity, and water to air pressure ratios in the fog generating system. Transmissometer effectiveness is discussed and the development of a short base line transmissometer described. The role of background brightness as a factor in runway visible range is discussed and limited data on the effect presented. Author

N74-32725# Federal Aviation Administration, Washington, D.C.
FAA REPORT ON AIRPORT CAPACITY. VOLUME 1: NATIONAL SUMMARY
Jan. 1974 98 p refs
(Contract DOT-FA70WA-2448)
(AD-774784; FAA-EM-74-5-Vol-1; M74-12-Vol-1) Avail: NTIS HC $4.00

The problem of airport capacity was studied by examining the activities at the following major airports: (1) Atlanta; (2) Chicago O'Hare; (3) Denver; (4) Los Angeles; (5) Miami; (6) New York Kennedy; (7) Philadelphia; and (8) San Francisco. The surveys indicated that visual flight rule (VFR) capacities will increase about 25 percent, and that instrument flight rule (IFR) capacities will increase about 50 percent. A major requirement will be metering, spacing, and wake vortex avoidance systems installation, in which IFR capacity will rise from its present level of 75 percent of VFR capacity to about 90 percent, thus increasing the ability to maintain sustained all-weather operations. The improvements described will prevent all of the airports surveyed from experiencing peak hour VFR saturation, and only one airport is projected to experience peak hour IFR saturation. Author

N74-32726# Federal Aviation Administration, Washington, D.C.
FAA REPORT ON AIRPORT CAPACITY. VOLUME 2: EIGHT AIRPORT SURVEY
Jan. 1974 295 p refs
(Contract DOT-FA70WA-2448)
(AD-774789; FAA-EM-74-5-Vol-2; M74-12-Vol-2) Avail: NTIS HC $6.75

For abstract, see N74-32725.

N74-32727# National Aeronautical Establishment, Ottawa (Ontario).
A METHODOLOGY FOR MEASUREMENT OF VEHICLE PARAMETERS USED IN DYNAMIC STUDIES
G. L. Basso Jul. 1973 55 p refs
(MS-134; NRC-13497) Avail: NTIS HC $5.75

An experimental system has been developed to facilitate the measurement of vehicle parameters required in dynamic studies of the automobile. This report describes the measuring facilities comprising, basically, a configuration of air bearings. System requirements are outlined based on the methodology adopted for studies involving the vehicle-occupant-terrain-obstacle system. Several procedures and techniques used to measure vehicle suspension and inertial characteristics are also outlined. System performance is illustrated by typical measurements made on a vehicle used in a program of studies directed towards the development of a validated model of the highway cable barrier for parametric studies of vehicle redirection using digital simulation. Author

N74-32728*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE NASA LANGLEY BUILDING SOLAR PROJECT AND THE SUPPORTING LEWIS SOLAR TECHNOLOGY PROGRAM
Robert G. Ragsdale and David Namkoong 1974 34 p refs Presented at the Intern. Solar Energy Soc. Meeting, Fort Collins, Colo., 19-23 Aug. 1974
(NASA-TM-X-71600; E-8075) Avail: NTIS HC $3.25 CSCL 14B

The use of solar energy to heat and cool a new office building that is now under construction is reported. Planned for completion in December 1975, the 53,000 square foot, single story building will utilize 15,000 square feet of various types of solar collectors in a test bed to provide nearly all of the heating demand and over half of the air conditioning demand. Drawing on its space-program-developed skills and resources in heat transfer, materials, and systems studies, NASA-Lewis will provide technology support for the Langley building project. A solar energy technology program underway at Lewis includes solar collector testing in an indoor solar simulator facility and in an outdoor test facility, property measurements of solar panel coatings, and operation of a laboratory-scale solar model system test facility. Based on results obtained in this program, NASA-Lewis will select and procure the solar collectors for the Langley test bed. Author

N74-32729# European Space Research Organization, Paris (France).
DESCRIPTION OF THE SECONDARY AIR SUPPLY PLANT FOR THE LOW-VELOCITY WIND TUNNEL OF THE DFVLR AT BRUNSWICK
Heinz Hoheisel Jun. 1974 46 p refs Transl. into ENGLISH of Bes chreibung der Sekundaer-Luftversorgungsanlage des Niedergeschwindigkeitswindkanals der DFVLR Braunschweig, DLR-Mitt-73-14, DFVLR, 20 Mar. 1973
(ESRO-TT-63; DLR-Mitt-73-14) Avail: NTIS HC $5.50; DFVLR, Porz, West Ger. 12.50 DM

The secondary air supply for the low velocity wind tunnel consists of two screw compressors and two rotary compressors. Screw compressors are suitable for pressure and suction operation, while the rotary compressors can be used for suction operation only. Screw compressors, when operated in parallel attain a maximum mass flow of about 14,350 cum/h with an increase of pressure of 3.5 atmospheres and in series operation a mass flow of 11,000 cum/h with an increase of pressure of 9

atmospheres. In suction operation a vacuum is possible down to 0.3 atmosphere. The rotary compressors attain a mass flow of about 12,000 cum/h and it is possible to reach a vacuum down to 0.2 atmosphere. Technical details of the complete installation and the possible range of application of both compressors are described. Author (ESRO)

N74-32730# GEOMET, Inc., Rockville, Md.
VEHICLE BEHAVIOR IN AND AROUND COMPLEX SOURCES AND RELATED COMPLEX SOURCE CHARACTERISTICS. VOLUME 2: AIRPORTS Final Report
Scott D. Thayer Aug. 1973 74 p refs
(Contract EPA-68-02-1094)
(PB-231360/9; EPA-450/3-74-003b) Avail: NTIS HC $6.75 CSCL 13B

A general methodology is presented for relating parameters of ground traffic behavior in and around airports, including trip generation rates and vehicle running time, to more rapidly available characteristics of airports, including size and nature of airport population and size and nature of air traffic. Such relationships are to be used to relate airport characteristics to air quality. GRA

N74-32731# Kaman Avidyne, Burlington, Mass.
CORRELATION OF SIDE FORCE AND YAWING MOMENT DATA FOR TACV CONFIGURATIONS AT LARGE ANGLES OF SIDESLIP Final Report, Sep. 1971 - Jun. 1972
J. Ray Ruetenik Jan. 1974 70 p refs
(Contract DOT-TSC-171)
(PB-230000/2; DOT-TSC-UMTA-72-11; FRA-ORD/D-74-29) Avail: NTIS HC $3.75 CSCL 13F

Methods developed by Woolard and Ruetenik and Zartarian for predicting the side force and yawing moment on TACV configurations due to side winds are compared against available data from wind-tunnel tests. The predicted side force based on slender-body theory is found in good agreement with the data from moving-ground plane tests for sideslip angles less than 5 degrees. Above 5 degrees, fair agreement is found by incorporating viscous-cross flow effects in the theory, although characteristic differences are observed from previous correlations for missile-type bodies. The measured yawing moment is 15 to 35% less than the slender-body prediction, and it differs markedly from viscous-flow predictions. (Modified author abstract) GRA

N74-32732# Mitre Corp., McLean, Va.
TRACKED AIR CUSHION RESEARCH VEHICLE (TACRV). AIR CUSHION EXPERIMENTAL/THEORETICAL CORRECTION Final Report
J. R. Freelin Oct. 1973 48 p refs
(Contract DOT-FR-30015)
(PB-231076/1; MTR-6535; FRA-ORD/D-74-33) Avail: NTIS HC $5.50 CSCL 13F

A modified version of the exponential theory of peripheral jet operation was selected by the manufacturer of TACRV for the prediction of the steady state performance of the TACRV air cushions. Air cushion performance observed during subsystem development tests indicate further modification is required to match the theory to test results. Subsequently, a slightly more concordant set of equations according to Burgess-Baratt were modified to account for the geometric effects of the TACRV nozzle. The resulting theory and test data appear to be in good agreement. The revised predictions of the present/flow/height performance of the TACRV levitation and guidance cushions present a more accurate estimation of their behavior. Further verification of the revised theory, based on data from the TACRV test program, will provide information for improved design of future TACRVs. It should be noted that since the publishing of this report, the Tracked Air Cushion Research Vehicle (TACRV) has been renamed the Tracked Levitated Research Vehicle (TLRV). GRA

N74-32733# New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.
SKID-RESISTANCE EVALUATION OF SEVEN ANTIHYDROPLANING SURFACES Final Report, 1 Nov. 1973 - 1 Feb. 1974
Phil V. Compton and Emil R. Hargett May 1974 47 p ref
(Contract F29601-74-C-0030; AF Proj. 683M)
(AD-780589; AFWL-TR-74-64) Avail: NTIS CSCL 01/5

Skid-resistance evaluations of seven antihydroplaning test strips were conducted between 15 to 20 November 1973. The test surfaces included a slurry seal, a grooved slurry seal, three test sections of Palmer Pavetread with various groove patterns and two porous friction surfaces, one with an emulsified asphalt and the other with 120-150 PEN asphalt and 5% rubber additive. Results indicate all surfaces provide a significant reduction in hydroplaning potential. A further test program is to be conducted to evaluate the performance of these surfaces under traffic and environmental conditions. Author (GRA)

N74-32734# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
ENGINEER DESIGN TEST OF MODIFIED XM19 SPECIAL SURFACING LANDING MAT Final Report
Gordon L. Carr May 1974 49 p refs
(DA Proj. 1G7-64717-DH-01)
(AD-781480; AEWES-Misc-Paper-S-74-12) Avail: NTIS CSCL 01/5

The standard XM19 was modified by using a thicker top skin and this mat was designated XM19 special surfacing. The mat was traffic tested with the medium-duty loading consisting of a 25,000-lb single-wheel load (SWL) on a tire inflated to 250-psi pressure. The mat supported in excess of 1600 coverages of the above loading on a subgrade strength of 4 CBR, which is 60% over the required coverages. The coefficients of friction of the mat surface of 0.62 dry and 0.53 wet are within the acceptable limits of 0.80 and 0.40 as specified by the QMR. The mats sustained the required 20 passes of the load cart in the same spot over a 1-in.-diam arresting cable without fracture of the top mat surface. The blast test of 300F for 5 sec did not cause any detrimental effects, and the mats successfully passed laboratory tests for compressive, shear, and flexural strength. (Modified author abstract) GRA

N74-32735# Geophysical Survey Systems, Inc., North Billerica, Mass.
FEASIBILITY STUDY FOR RAPID EVALUATION OF AIRFIELD PAVEMENTS Final Report, Mar. 1971 - Jan. 1972
C. L. Bertram, R. M. Morey, and S. S. Sandler Jun. 1974 106 p refs
(Contract F29601-71-C-0068; AF Proj. 683M)
(AD-781793; AFWL-TR-71-178) Avail: NTIS CSCL 01/5

An investigation was conducted to determine the feasibility of using noncontacting sensor techniques to rapidly evaluate airfield pavements. A literature survey, laboratory test, and field tests were conducted. A broadband video pulse radar system was found to be the most successful. During field tests with this radar system, trenches, pipes, and various soil interfaces were observed and verified. The report described the work done, the video radar system, and a plan for future development of the system to meet pavement evaluation requirements. Author (GRA)

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N74-32736 Engineering Sciences Data Unit, London (England).
PERFORMANCE IN INCOMPRESSIBLE FLOW OF PLANE-WALLED DIFFUSERS WITH SINGLE-PLANE EXPANSION
Jun. 1974 28 p refs Sponsored by Roy. Aeron. Soc., Institution of Chem. Engrs., Institution of Mech. Engrs., and Institution of Structural Engr.
(ESDU-74015) Copyright. Avail: Issuing Activity

Information is presented on static-pressure recovery, total-pressure loss, and overall flow pattern for fluids flowing through straight-axis, plane-walled diffusers of rectangular section having only one or two walls diverging. Data are presented for diffusers operating under certain basic conditions. Examples of the

application and a step-by-step procedure for diffuser flow are given. Author

N74-32737 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
TURBOMACHINE FIREBOX DIMENSION REDUCTION BY INCREASE OF FLAME PROPAGATION SPEED UNDER ACCELERATION EFFECTS Final Report [ETUDE DE LA REDUCTION DES DIMENSIONS DE FOYER DE TURBOMACHINES PAR ACCROISSEMENT DE LA VITESSE DE PROPAGATION DE LA FLAMME SOUS L'EFFET DE L'ACCELERATION]
Andre Mestre, Andre Benoit, and Gerard Collin Jun. 1973 75 p refs In FRENCH
(Contract DGRST-71-7-2877)
Avail: Issuing Activity

The dimensions of turbomachine fire boxes are shown to be reduced when a rotational component is imposed on the flow. This system accelerates the mixture formation and flame propagation. The compressor output rectifier may be suppressed as well as the input distributor. Test results show that the elementary focus is characterized by a very strong centrifugal acceleration. Other set-ups with fixed or variable distributors are considered. ESRO

N74-32738# Aeronautical Research Labs., Melbourne (Australia).
PRESSURE DISTRIBUTIONS IN SLOT TYPE ROUGH WALLS UNDER TURBULENT BOUNDARY LAYERS
W. H. Schofield, A. E. Perry (Melbourne Univ.), and P. N. Joubert (Melbourne Univ.) Dec. 1973 20 p refs
(ARL/ME-Note-345) Avail: NTIS HC $4.00

Measurements of the pressure distribution on individual roughness elements under a turbulent bounday layer were made. The wall roughness consisted of an array of two dimensional transverse slots. The two geometries considered were an approximately square cross section slot and a wide slot. It was found that the pressure patterns did not exhibit the simple similarity expected from flow visualization tests. A method of correlating the pressure patterns is proposed for the square cross section roughness which is applicable for both zero and adverse pressure gradient cases. The pressure patterns on the wider space roughness do not show the same behavior, and cannot be correlated by the same method for the reasons discussed. Author

N74-32739# Aeronautical Research Labs., Melbourne (Australia).
MASS AND MOMENTUM TRANSFER IN A SEPARATED RECIRCULATING FLOW
W. H. Schofield and T. S. Keeble Nov. 1973 45 p refs
(ARL/ME-Note-344) Avail: NTIS HC $5.25

Measurements of mean flow and mass exchange are reported for a ducted flow in which a large recirculating separated region was presented. The separated region was generated by placing a baffle on the axis of the duct and was closed by reducing the duct diameter downstream of the baffle. Techniques that were used to analyze simple free mixing layers require some reinterpretation to give a good description of the present flow. The results follow the usual relations. However, the rates of mixing layer growth and the values and ratio of the diffusion constants are found to be substantially different to those found in simple free layers. Author

N74-32740# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
INCIPIENT SEPARATION OF A COMPRESSIBLE TURBULENT BOUNDARY LAYER
Cyriel Appels Apr. 1974 62 p refs
(VKI-TN-99) Avail: NTIS HC $6.25

Results are presented of an investigation of turbulent boundary layer incipient separation in a compression corner. The experiments were carried out on the walls of two blowdown facilities at Mach numbers of 3.5 and 5.4 and at unit Reynolds numbers between 10 to the 7th power and 10 to the 8th power per meter. Profile measurements showed that when undisturbed, the turbulent boundary layer was fully developed in all cases examined. Small separated flow regions were detected at relatively low wedge angles, using liquid line and schlieren methods. The effect on the separated flow behaviour of Mach and Reynolds number, state of the turbulent boundary layer and the influence of the incipient separation detection method was investigated and the results were compared with previous experimental data. An approximate method was developed for predicting incipient separation, using as a basis the observed existence of very small separation bubbles. Author

N74-32741# Aeronautical Research Labs., Melbourne (Australia).
PRESSURE DISTRIBUTIONS AND FORCES ON AGARD MODELS HB1 AND HB2 AT M EQUALS 7.5
A. R. Gilchrist and M. J. Williams Feb. 1974 29 p refs
(ARL/A-346) Avail: NTIS HC $4.50

Forces and surface pressure on AGARD models HB1 and HB2 have been studied in the ARL hypersonic tunnel at Mach 7.5. Test Reynolds numbers were lower than for previously published data and provide a useful extension of the range over which these models have been tested. Results indicate little influence of Reynolds number on force coefficients although some effect was found on the pressure distribution. Variation of sting diameter from 0.3 to 0.5 body diameters produced no detectable effect on body pressure except on the base. Author

N74-32742# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
EXPERIMENTAL STUDIES ON LAMINAR LEVEL AND CURVED FLOWS [EXPERIMENTELLE UNTERSUCHUNGEN VON STROEMUNGEN IN EBENEN UND GEKRUEMMTEN LAMELLEN]
Peter E. M. Schneider Jul. 1974 60 p refs In GERMAN
(Rept-6/1974) Avail: NTIS HC $6.00

Experiments to determine the characteristics and structure of laminar air flow were conducted using various flow visualization techniques. The flow pattern around bodies of revolution of various configurations are illustrated. The apparatus used for flow visualization and photography is described. The use of soap bubbles for flow visualization is emphasized. The flow distribution and distortions produced by mixing jet air streams moving at different velocities and in different directions are analyzed and photographically recorded. Transl. by P.N.F.

N74-32743# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
MEASUREMENTS IN THE REGION OF RECIRCULATION BEHIND A DISC
D. F. G. Durao and J. H. Whitelaw Mar. 1974 25 p refs Presented at Laser Velocimetry Workshop, Lafayette, Ind., Mar. 1974 Sponsored by NATO, Sci. Res. Council, and Inst. de Alta Cultura
(HTS/74/14) Avail: NTIS HC $4.25

Measurements of the axial velocity component are reported downstream of a disc baffle surrounded by an annular jet, with particular attention paid to the recirculation zone. The measurements were obtained with a laser anemometer incorporating a Bragg cell which allowed light-frequency shifting and, therefore, measurements in regions of near zero velocity and high turbulence intensity. Three signal processing arrangements were used and yielded measurements which were in close agreement. Two of the signal processing arrangements made use of a frequency analyser; first in the normal analogue manner, and second, in a counting mode. The third arrangement made use of a computing counter. Author

N74-32744# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
STATISTICAL CHARACTERISTICS OF A TURBULENT JET
M. M. Ribeiro and J. H. Whitelaw Feb. 1974 34 p refs
(HTS/74/19) Avail: NTIS HC $4.75

Measured velocity probabilities distributions and autocorrelation functions were measured in the downstream region of a round, free jet. Online digital sampling procedures were used to interpret the signals from a crossed, hot wire probe. Particular attention was paid to the probabilities of the axial and radial velocity components and of the angle between them at radial locations corresponding to the center line, the location of maximum shear stress, and an edge location at r/x of 0.087. The results show, for example, that the probability of the axial velocity on the center line is slightly non-Gaussian and that, in general, the observed deviations of the probabilities of u depend upon the

difference in behavior of the corresponding distributions for positive and negative v; outwards transport (positive v) is associated with near Gaussian u-distributions whereas inwards transport (negative v) is associated with skewed u-distributions. Author

N74-32745# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
PREDICTION OF TURBULENT FLOW IN CURVED PIPES
S. V. Patankar (Waterloo Univ.), V. S. Pratap, and D. B. Spalding Jan. 1974 33 p refs
(HTS/74/1) Avail: NTIS HC $4.75

A finite difference procedure is employed to predict the development of turbulent flow in curved pipes. The turbulence model used involves the solution of two differential equations, one for the kinetic energy of turbulence and the other for its dissipation rate. Predicted total velocity contours for the developing flow in a 180 deg bend are compared with the experimental data. Predictions of fully developed velocity profiles of long helically wound pipes are also presented and compared with experimental measurements. Author

N74-32746*# Alabama Univ., Huntsville. School of Graduate Studies and Research.
A STUDY OF FORCED FLOW SEPARATION IN ROCKET NOZZLE Final Report
J. N. Chiou and R. J. Hung Jul. 1974 38 p refs Sponsored by NASA
(NASA-CR-120422) Avail: NTIS HC $5.00 CSCL 20D

The characteristics of flow profile in a rocket nozzle during the start transient were investigated as well as possibilities of reducing the side-load thrust by sticking trip wires in the nozzle. To simplify the geometry of flow configuration around the trip wire, it was assumed that the flow is passing through square steps instead of round wires. Since a purely analytic solution is not available, a series of semiempirical solutions was proposed. Author

N74-32747*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN EXPERIMENTAL AND NUMERICAL STUDY OF WAVE MOTION AND UPSTREAM INFLUENCE IN A STRATIFIED FLUID
David A. Hurdis Washington Aug. 1974 90 p refs
(NASA-TN-D-7744; G-7440) Avail: NTIS HC $4.00 CSCL 20D

A system consisting of two superimposed layers of liquid of different densities, with a thin transition layer at the interface, provides a good laboratory model of an ocean thermocline or of an atmospheric inversion layer. This research was to gain knowledge about the propagation of disturbances within these two geophysical systems. The technique used was to observe the propagation of internal waves and of upstream influence within the density-gradient region between the two layers of liquid. The disturbances created by the motion of a vertical flat plate, which was moved longitudinally through this region, were examined both experimentally and numerically. An upstream influence, which resulted from a balance of inertial and gravitational forces, was observed, and it was possible to predict the behavior of this influence with the numerical model. The prediction included a description of the propagation of the upstream influence to steadily increasing distances from the flat plate and the shapes and magnitudes of the velocity profiles. Author

N74-32748*# Westinghouse Astronuclear Lab., Pittsburgh, Pa. Astronuclear Lab.
FLOW STUDIES IN A WET STEAM TURBINE Contractor Report, 30 Jun. 1969 - 31 Mar. 1974
D. H. Evans and W. D. Pouchot 13 Aug. 1974 156 p refs (Contract NAS3-13230)
(NASA-CR-134683; WANL-13230F) Avail: NTIS HC $5.00 CSCL 20D

The design and test results of a four stage wet vapor turbine operating with slightly superheated inlet steam and expanding to 10% exit moisture are presented. High speed movies at 3000 frames per second of liquid movement on the pressure side and along the trailing edge of the last stator blade are discussed along with back lighted photographs of moisture drops as they were torn from the stator blade trailing edge. Movies at lower framing rates were also taken of the exit of the last rotating blade and the casing moisture removal slot located in line with the rotor blade shroud. Also moisture removal data are presented of casing slot removal at the exit of the third and fourth rotor blades and for slots located in the trailing edge of the last stator blade. Finally, the degradation of turbine thermodynamic performance due to condensation formation and movement is discussed. Author

N74-32749*# Kanner (Leo) Associates, Redwood City, Calif.
AXIAL FANS WITH AN EXTENDED STEADY OPERATION REGION
I. V. Brusilovskiy and A. G. Bushel Washington NASA Sep. 1974 13 p refs Transl. into ENGLISH from Prom. Aerodinam. (Moscow), no. 29, 1973 p 88-97
(Contract NASw-2481)
(NASA-TT-F-15949) Avail: NTIS HC $4.00 CSCL 20D

The control characteristics of a single-stage axial fan with meridional flow acceleration in the rotor are discussed. The rotor is equipped with a flow separation prevention device in order to extend the region of steady operation of the fan. The effects of two different flow separation preventing devices on the control characteristics of two-stage axial fans are analyzed when the rotor blades in the fans are set at different angles. Author

N74-32750# Royal Aircraft Establishment, Farnborough (England).
SUPERSONIC FLOW THROUGH STATIONARY AND ROTATING BLADE CASCADES
B. Becker and H. Simon May 1974 28 p refs Transl. into ENGLISH from Z. Flugwiss. (Brunswick), v. 20, no. 1/2, 1972 p 26-35
(RAE-Lib-Trans-1762; BR42130) Avail: NTIS HC $4.50

In comparison with the simple supersonic channel flow, two major factors must be taken into account in designing supersonic cascades. If the inlet Mach number has a subsonic component perpendicular to the cascade front, the shock wave in front of the leading edge of each blade will change the inlet condition of all successive blade channels of the cascade. In this manner, an axially arranged supersonic cascade affects the direction of flow and the Mach number in the entire flow field. In calculating the flow through rotating blades, also the centripetal and Coriolis acceleration must be taken into account. The flow through a supersonic compressor rotor is determined by means of a suitably enlarged method of characteristics. A division of the blade channel into two sets of stream surfaces permits an iterative calculation of the three-dimensional flow. Author

N74-32751*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
BOUNDARY-LAYER TRANSITION AND DISPLACEMENT THICKNESS EFFECTS ON ZERO-LIFT DRAG OF A SERIES OF POWER-LAW BODIES AT MACH 6
George C. Ashby, Jr. and Julius E. Harris Washington Sep. 1974 66 p refs
(NASA-TN-D-7723; L-9646) Avail: NTIS HC $3.75 CSCL 20D

Wave and skin-friction drag have been numerically calculated for a series of power-law bodies at a Mach number of 6 and Reynolds numbers, based on body length, from 1.5 million to 9.5 million. Pressure distributions were computed on the nose by the inverse method and on the body by the method of characteristics. These pressure distributions and the measured locations of boundary-layer transition were used in a nonsimilar-boundary-layer program to determine viscous effects. A coupled iterative approach between the boundary-layer and pressure-distribution programs was used to account for boundary-layer displacement-thickness effects. The calculated-drag coefficients compared well with previously obtained experimental data. Author

N74-32752# Politecnico di Torino (Italy). Inst. di Macchine e Motori per Aeromobili.
TWO-DIMENSIONAL AND AXISYMMETRIC FLOW IN SUPERSONIC EJECTOR NOZZLES [FLUSSI BIDEMENSIONALI E ASSIALSIMMETRICI IN UGELLI EIETTORI SUPERSONICI]
Luca Zannetti Feb. 1974 30 p refs In ITALIAN

(Publ-158) Avail: NTIS HC $4.50

Supersonic ejectors in bidimensional or axisymmetric flow were studied. Hypotheses are made for negligible mix of fluids which are supposed to be compressible, inviscid, and perfect. The regimes studied range from zero secondary fluid injection to maximum compatible with the choking situation. The secondary fluid is assumed to be one dimensional and subsonic. For the axialsymmetric supersonic primary fluid, the case in which shock appears due to pressure wave coalescence is detailed. Their evolution was studied explicitly imposing the Rankine-Hugoniot relation. The case of Mach disk formation was not considered. The analysis of the power jet was made using finite difference theory methods for solving systems of hyperbolic partial derivative equations. The case of the movement field discontinuity due to shocks is discussed. ESRO

N74-32753# European Space Research Organization, Paris (France).

STUDIES ON THE UNSTEADY APPROACH METHOD OF COMPUTING THE FRICTIONLESS FLOW PAST BLUNT BODIES AT SUPERSONIC SPEED

Ermin Plaetschke Jul. 1974 117 p refs Transl. into ENGLISH of Untersuch. ueber die Instationaere Methode der Berechnung der Reibungslosen Stroemung um Stumpfe Koerper bei Ueberschallgeschwindigkeit, DLR-FB-73-10, DFVLR, 1973

(ESRO-TT-81; DLR-FB-73-10) Avail: NTIS HC $9.00; DFVLR, Porz, West Ger. 21.50 DM

A method for computing the supersonic flow past blunt bodies is investigated. The unsteady approach method considered here represents a finite difference method based on the unsteady time dependent equations of motion. These equations are transformed into difference equations by means of a special finite difference scheme. The solution of the steady problem results as a final state of an unsteady transfer. The method is extended to become independent of the shape of the body, the flow around which is being considered. A refinement of the solutions is obtained by the use of an extrapolation procedure. Different plane symmetric flow are computed and the solutions compared with experimental and other numerical results. Author (ESRO)

N74-32754# Colorado Univ., Boulder. Dept. of Mechanical Engineering.

MASS ADDITION IN LAMINAR AND TURBULENT FLOWS Final Report

D. R. Kassoy Apr. 1974 15 p refs

(Grant NSF GK-24689)

(PB-231316/1; CUMER-73-5) Avail: NTIS HC $4.00 CSCL 20D

A systematic analysis of separated boundary-layer flows with mass addition has been carried out. Particular emphasis has been placed on developing solutions for large Reynolds numbers. This requirement has led to the use of stronge interaction theory. Here the basic notion is that of a relatively thick injectant layer interacting with the external uniform flow to produce weak but finite pressure gradients. Interaction theory is important in this investigation. The methods developed have been used to consider: The spatial stability of a blown off shear layer similarity solution; the effects of foreign gas addition on heat transfer and wall shear reduction; and the free shear layer reattachment process. GRA

N74-32755# Sydney Univ. (Australia). Dept. of Aeronautical Engineering.

NUMERICAL STUDIES IN GAS DYNAMICS Interim Scientific Report, 15 Apr. 1973 - 14 Apr. 1974

G. A. Bird 15 Apr. 1974 5 p refs

(Grant AF-AFOSR-2336-72)

(AD-780611; AFOSR-74-0884TR) Avail: NTIS CSCL 20/4

Research is reported on separation effects in the flow of binary gas mixtures, and the interaction of a jet with a boundary. Announcement is made of a monograph on molecular gas dynamics. GRA

N74-32756# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CALCULATION OF THE AERODYNAMIC CHARACTERISTICS OF A TWISTED JET

R. B. Akhmedov and T. E. Balagula 17 Jun. 1974 20 p refs Transl. into ENGLISH from Tech. Prakt. Szhiganiya Gaza (USSR), v. 5, 1972 p 15-27

(AD-781657; FTD-HT-23-865-74) Avail: NTIS CSCL 20/4

The work presents the results of the experimental and calculation study of a twisted jet flowing from an axial-flow swirl vane of the blade type and from an axial-tangential blade and helical swirl vanes. It presents the basic structural parameters of the studied swirl vanes and the value of twist parameters. GRA

N74-32757# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE STRUCTURE OF A THREE-DIMENSIONAL FLOW FROM PLANE FLOWS

V. A. Shchepanovskii 18 Jun. 1974 12 p refs Transl. into ENGLISH from Izv. Sib. Otd. Akad. Nauk SSSR, Ser. Tekh. Nauk (USSR), no. 8, 1972 p 71-74

(AD-781629; FTD-HT-23-1808-74) Avail: NTIS CSCL 20/4

The work examines the problem of the structure of a three-dimensional streamline flow about a geometric form from parts of plane flows. GRA

N74-32758# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CALCULATION OF THE CHARACTERISTICS OF AERODYNAMIC DAMPING OF BODIES OF REVOLUTION

V. S. Bykov 17 Jun. 1974 12 p ref Transl. into ENGLISH from Teplo- i Massoperenos (USSR), 1969 p 1-7

(AD-781625; FTD-HT-23-1363-74) Avail: NTIS CSCL 20/4

An attempt was made to obtain practical recommendations from an approximate calculation of the sum of rotational derivatives with sufficient accuracy for a wide range of change of the parameters which characterize the geometry of bodies of revolution and a flow-around regime. Special attention was given to the development of generalized specifying parameters on the basis of the experiments conducted. Author (GRA)

N74-32759# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

DUST TURBULENCE OF THE WORKING FLOW IN A HYPERSONIC NOZZLE

B. I. Bakum 24 Jun. 1974 11 p refs Transl. into Izv. Sib. Otd. Akap. Nauk SSSR, Ser. Tekh. Nauk (USSR), v. 8, no. 2, Jun. 1969 p 32-35

(AD-781631; FTD-HT-23-1801-74) Avail: NTIS CSCL 20/4

In the literature there are practically no data on the degree of turbulence of the working flow in hypersonic wind tunnels, but it usually has been considered that the flow is laminar. However, during low-exposure photography of the working flow of a hypersonic tunnel, turbulence is clearly seen. One reason for the appearance of this turbulence can be the dust content of the working flow which is characteristic of all tunnels, especially hypersonic wind tunnels. GRA

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N74-32760*# Honeywell, Inc., Minneapolis, Minn. Systems and Research Div.

AUTOMATIC PHOTOINTERPRETATION FOR LAND USE MANAGEMENT IN MINNESOTA Final Report

G. D. Swanlund, Principal Investigator, L. Kirvida, M. Cheung, D. Pile, and R. Zirkle 21 Jun. 1974 65 p Original contains color illustrations ERTS

(Contract NAS5-21742)

(E74-10687; NASA-CR-139220) Avail: NTIS HC $6.25 CSCL 08B

The author has identified the following significant results. Automatic photointerpretation techniques were utilized to evaluate the feasibility of data for land use management. It was shown that ERTS-1 MSS data can produce thematice maps of adequate resolution and accuracy to update land use maps. In particular,

five typical land use areas were mapped with classification accuracies ranging from 77% to over 90%.

N74-32761*# Agricultural Research Service, Weslaco, Tex.
IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING Monthly Progress Report, Jul. - Aug. 1974
Craig L. Wiegand, Principal Investigator Aug. 1974 1 p EREP
(NASA Order T-4105-B)
(E74-10708; NASA-CR-139541; MPR-8) Avail: NTIS HC $4.00 CSCL 02C
There are no author-identified significant results in this report.

N74-32762*# Environmental Research Inst. of Michigan, Ann Arbor.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Jul. 1974
Richard F. Nalepka and William A. Malila, Principal Investigators 21 Aug. 1974 2 p EREP
(Contract NAS9-13280)
(E74-10725; NASA-CR-139622; ERIM-101900-36-L) Avail: NTIS HC $4.00 CSCL 05B
There are no author-identified significant results in this report.

N74-32763*# Sheffield Univ. (England). Dept. of Geography.
STEREO STUDY AS AN AID TO VISUAL ANALYSIS OF ERTS AND SKYLAB IMAGES
J. L. VanGenderen, Principal Investigator Nov. 1973 10 p refs Sponsored by NASA EREP
(E74-10734; NASA-CR-139624) Avail: NTIS HC $4.00 CSCL 05B
The author has identified the following significant results. The parallax on ERTS and Skylab images is sufficiently large for exploitation by human photointerpreters. The ability to view the imagery stereoscopically reduces the signal-to-noise ratio. Stereoscopic examination of orbital data can contribute to studies of spatial, spectral, and temporal variations on the imagery. The combination of true stereo parallax, plus shadow parallax offer many possibilities to human interpreters for making meaningful analyses of orbital imagery.

N74-32764*# Kansas Univ., Lawrence.
SKYLAB STUDY OF WATER QUALITY Progress Report, Jun. - Aug. 1974
Harold L. Yarger, Principal Investigator and James R. McCauley Aug. 1974 10 p refs EREP
(Contract NAS9-13271)
(E74-10735; NASA-CR-139625) Avail: NTIS HC $4.00 CSCL 08H
The author has identified the following significant results. Analysis of S-190A imagery from 1 EREP pass over 3 reservoirs in Kansas establishes a strong linear correlation between the red/green radiance ratio and suspended solids. This result compares quite favorably to ERTS MSS CCT results. The linear fits RMS for Skylab is 6 ppm as compared to 12 ppm for ERTS. All of the ERTS satellite passes yielded fairly linear results with typical RMS values of 12 ppm. However, a few of the individual passes did yield RMS values of 5 or 6 ppm which is comparable to the one Skylab pass analyzed. In view of the cloudy conditions in the Skylab photos, yet good results, the indications are that S-190A may do somewhat better than the ERTS MSS in determining suspended load. More S-190A data is needed to confirm this. As was the case with the ERTS MSS, the Skylab S-190A showed no strong correlation with other water quality parameters. S-190B photos because of their high resolution can provide much first look information regarding relative degrees of turbidity within various parts of large lakes and among smaller bodies of water.

N74-32765*# Corps of Engineers, Waltham, Mass.
NEW ENGLAND RESERVOIR MANAGEMENT Quarterly Progress Report, 23 Apr. - 23 Jul. 1974
Saul Cooper and Duwayne Anderson, Principal Investigators (CRREL) 23 Jul. 1974 5 p EREP
(NASA Order T-4646-B)
(E74-10736; NASA-CR-139626; QPR-5) Avail: NTIS HC $4.00 CSCL 08H
There are no author-identified significant results in this report.

N74-32766*# Northern Prairie Wildlife Research Center, Jamestown, N. Dak.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Aug. 1974
David S. Gilmer, Principal Investigator Aug. 1974 3 p EREP (NASA Order T-4114-B)
(E74-10737; NASA-CR-139627) Avail: NTIS HC $4.00 CSCL 06C
There are no author-identified significant results in this report.

N74-32767*# Nebraska Univ., Lincoln. Dept. of Agronomy.
EVALUATION OF ERTS-1 IMAGERY IN MAPPING AND MANAGING SOIL AND RANGE RESOURCES IN THE SAND HILLS REGION OF NEBRASKA Semiannual Progress Report, 1 Jan. - 30 Jun. 1974
James V. Drew, Principal Investigator and Paul M. Seevers Aug. 1974 11 p ref ERTS
(Contract NAS5-21756)
(E74-10738; NASA-CR-139628) Avail: NTIS HC $4.00 CSCL 08B
There are no author-identified significant results in this report.

N74-32768*# Virginia Inst. of Marine Science, Gloucester Point.
SOUTHERN CHESAPEAKE BAY WATER COLOR AND CIRCULATION ANALYSIS Monthly Report, Jun. 1974
William J. Hargis and Maynard M. Nichols, Principal Investigators 7 Aug. 1974 1 p EREP
(Contract NAS6-2327)
(E74-10739; NASA-CR-139629) Avail: NTIS HC $4.00 CSCL 08J
There are no author-identified significant results in this report.

N74-32769*# Sheffield Univ. (England). Dept. of Geography.
HYDRO-GEOLOGICAL DATA FROM SKYLAB EREP IMAGERY OF THE MURCIA PROVINCE, S. E. SPAIN
J. L. VanGenderen, Principal Investigator Aug. 1974 38 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(E74-10740; NASA-CR-139630) Avail: NTIS HC $5.00 CSCL 08B
There are no author-identified significant results in this report.

N74-32770*# Institut Francais du Petrole, Rueil-Malmaison.
TECTONICS RELATIONSHIPS BETWEEN PYRENEES AND ALPS (SOUTHERN FRANCE) Progress Report, Apr. - May 1974
Jacques Guillemot, Principal Investigator Jun. 1974 4 p Sponsored by NASA EREP
(E74-10743; NASA-CR-139983; PR-3) Avail: NTIS HC $4.00 CSCL 08G
There are no author-identified significant results in this report.

N74-32771*# Delaware Univ., Newark. College of Marine Studies.
SKYLAB AND ERTS-1 INVESTIGATIONS OF COASTAL LAND USE AND WATER PROPERTIES
V. Klemas, Principal Investigator, D. Bartlett, and R. Rogers (Bendix Corp., Ann Arbor, Mich.) 17 Sep. 1974 2 p ERTS
(Contracts NAS5-21837; NAS1-12304)
(E74-10745; NASA-CR-139985) Avail: NTIS HC $4.00 CSCL 08B
The author has identified the following significant results. ERTS-1 multispectral scanner and Skylab's S190A, S190B, and S192 data products were evaluated for their utility in studying current circulation, suspended sediment concentrations and pollution dispersal in Delaware Bay and in mapping coastal

vegetation and land use. Imagery from the ERTS-1 MSS, S190A and S190B cameras shows considerable detail in water structure, circulation, suspended sediment distribution and within waste disposal plumes in shelf waters. These data products were also used in differentiating and mapping twelve coastal vegetation and land use classes. The spatial resolution of the S190A multispectral facility appears to be about 30 to 70 meters while that of the S190B earth terrain camera is about 10 to 30 meters. Such resolution, along with good cartographic quality, indicates a considerable potential for mapping coastal land use and monitoring water properties in estuaries and on the continental shelf. The ERTS-1 MSS has a resolution of about 70-100 meters. Moreover, its regular 18-day cycle permits observation of important changes, including the environmental impact of coastal zone development on coastal vegetation and ecology.

N74-32772*# Delaware Univ., Newark. College of Marine Studies.
MONITORING THE DISPERSION OF OCEAN WASTE DISPOSAL PLUMES FROM ERTS-1 AND SKYLAB
V. Klemas, Principal Investigator, G. Davis, and T. Myers 18 Sep. 1974 2 p ERTS
(Contracts NAS5-21837; NAS1-12304)
(E74-10746; NASA-CR-139986) Avail: NTIS HC $4.00 CSCL 08C

The author has identified the following significant results. About forty miles off the Delaware coast is located the disposal site for waste discharged from a plant processing titanium dioxide. The discharge is a greenish-brown; 15-20% acid liquid which consists primarily of iron chlorides and sulfates. The barge which transports this waste has a 1,000,000 gallon capacity and makes approximately three trips to the disposal site per week. ERTS-1 MSS digital tapes are being used to study the dispersion patterns and drift velocities of the iron-acid plume. Careful examination of ERTS-1 imagery disclosed a fishhook-shaped plume about 40 miles east of Cape Henlopen caused by a barge disposing acid wastes. The plume shows up more strongly in the green band than in the red band. Since some acids have a strong green component during dumping and turn slowly more brownish-reddish with age, the ratio of radiance signatures between the green and red bands may give an indication of how long before the satellite overpass the acid was dumped. Enlarged enhancements of the acid waste plumes, prepared from the ERTS-1 MSS digital tapes aided considerably in studies of the dispersion of the waste plume. Currently acid dumps are being coordinated with ERTS-1 overpasses.

N74-32773*# Delaware Univ., Newark. College of Marine Studies.
TRACKING AIR-DROPPED DROGUES AND DYES FROM AIRCRAFT IN SUPPORT OF ERTS-1 CIRCULATION STUDIES
V. Klemas, Principal Investigator, G. Davis, and H. Wang 16 Sep. 1974 2 p ERTS
(Contract NAS5-21837)
(E74-10747; NASA-CR-139987) Avail: NTIS HC $4.00 CSCL 08C

The author has identified the following significant results. For two years ERTS-1 has been employed to investigate current circulation patterns in Delaware Bay under different tidal, flow, and wind conditions. Since sufficient numbers of current meters and boats are not available, air-droppable drogues and dye packs have been developed and tested. The drogues consist of a styrofoam float and a line to which is attached a stainless steel biplane. The length of the line determines at what depth currents will be monitored. The floats are color coded to distinguish their movement and mark the depth of the biplanes. Simultaneously floating and anchored dye packs of fluorescein dye have been deployed from aircraft. The movement of the dye and drogues is tracked by sequential aerial photography, using fixed markers on shore or on buoys as reference points to calibrate the scale and direction of drogue movement. The current data obtained by this technique is then used to annotate current circulation maps derived from ERTS-1 imagery.

N74-32774*# Kansas Univ., Lawrence.
SKYLAB STUDY OF WATER QUALITY Progress Report, Mar. - May 1974
Harold L. Yarger, Principal Investigator and James R. McCauley May 1974 4 p EREP
(Contract NAS9-13271)
(E74-10748; NASA-CR-139988) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-32775*# Kansas Univ., Lawrence. Atmospheric Science Lab.
DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB Monthly Progress Report, Aug. 1974
Joe R. Eagleman, Principal Investigator and Wen C. Lin 31 Aug. 1974 13 p refs EREP
(Contract NAS9-13273)
(E74-10749; NASA-CR-139989; TR-239-16) Avail: NTIS HC $4.00 CSCL 04A

There are no author-identified significant results in this report.

N74-32776*# Consiglio Nazionale delle Ricerche, Milan (Italy). Lab. per la Geofisica della Litosfera.
MULTISPECTRAL PHOTOGRAPHY OF ITALIAN VOLCANIC ACTIVITY, VEGETATION, AND PALEO RIVER BEDS Progress Report
R. Cassinis, Principal Investigator, G. M. Lechi, C. M. Marino, and A. M. Tonelli 9 May 1974 3 p Sponsored by NASA EREP
(E74-10750; NASA-CR-139990; PR-1) Avail: NTIS HC $4.00 CSCL 08F

There are no author-identified significant results in this report.

N74-32777*# Utah Univ., Salt Lake City. Dept. of Geology and Geophysics.
MINERAL EXPLORATION AND GEOLOGY APPLICATIONS OF ERTS-1, EREP, AND RB-57F IMAGERY AND PHOTOGRAPHY OF THE UTAH - NEVADA AREA Quarterly Progress Report, 1 May -31 Jul. 1974
Mead LeRoy Jensen, Principal Investigator and Phillip Laylander 14 Jun. 1974 63 p Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13322)
(E74-10751; NASA-CR-139991) Avail: NTIS HC $6.25 CSCL 08G

There are no author-identified significant results in this report.

N74-32778*# Servicio Geologico de Bolivia, La Paz.
BOLIVIAN PARTICIPATION IN THE INVESTIGATION AND ANALYSIS OF EARTH RESOURCES EXPERIMENT (EREP Progress Report, Sep. - Dec. 1973
Carlos E. Brockmann, Principal Investigator Dec. 1973 4 p Sponsored by NASA EREP
(E74-10752; NASA-CR-139992) Avail: NTIS HC $4.00 CSCL 05B

There are no author-identified significant results in this report.

N74-32779*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
ANALYSIS OF DATA FROM SPACECRAFT (STRATOSPHERIC WARMINGS) Final Report, Sep. 1973 - Apr. 1974
24 Apr. 1974 197 p refs
(Contract NASw-2553)
(NASA-CR-140050; LMSC/D420934) Avail: NTIS HC $13.00 CSCL 04A

The details of the stratospheric warming processes as to time, area, and intensity were established, and the warmings with other terrestrial and solar phenomena occurring at satellite platform altitudes, or observable from satellite platforms, were correlated. Links were sought between the perturbed upper

atmosphere (mesosphere and thermosphere) and the stratosphere that might explain stratospheric warmings. Author

N74-32780*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AN OPTICAL PROCESS FOR PRODUCING CLASSIFICATION MAPS FROM MULTISPECTRAL DATA Patent Application
Richard E. Haskell, inventor (to NASA) (Oakland Univ.) Filed 30 Aug. 1974 29 p
(Grant NGR-23-054-006)
(NASA-Case-MSC-14472-1; US-Patent-Appl-SN-502138) Avail: NTIS HC $4.50 CSCL 08B

A method of producing single-class and multi-class composite classification maps from multispectral data is provided. The multispectral data is transformed into a binary matrix format which is then encoded on an optical medium such as photographic film. The encoded data is holographically correlated with coded patterns representing selected spectral signatures to produce signal-class classification maps. Several single-class maps are optically superimposed to produce multi-class composite classification maps. NASA

N74-32781# Joint Publications Research Service, Arlington, Va.
GEOPHYSICAL EQUIPMENT AND MEASUREMENTS
A. Ya. Rotshteyn 19 Aug. 1974 15 p refs Transl. into ENGLISH from Geofiz. App. (Leningrad), no. 53, 1973
(JPRS-62753) Avail: NTIS HC $4.00

The use of a self-oscillating quantum magnetometer, a transistorized ultrashort wave generator for quantum magnetometers, and a heat-stabilization system for the absorption chambers of a cesium quantum magnetometer are described. Author

N74-32782*# California Inst. of Tech., Pasadena.
INFRARED SKY NOISE SURVEY Final Report
J. A. Westphal 30 Jun. 1974 46 p
(Grant NGR-05-002-185)
(NASA-CR-139693) Avail: NTIS HC $5.50 CSCL 04A

A 10 micron infrared sky noise survey, which was conducted during the period from June 1, 1970 to June 30, 1974, is reported along with associated electronics and recording equipment which was developed and deployed for periods up to 18 months at various potential or existing infrared observing sites in the U.S., Mexico, and Chile. The results of the data activity are given, and variables are defined which influence the intensity and duration of the sky noise. Author

N74-32783*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CONTRIBUTION TO THE THEORY OF TIDAL OSCILLATIONS OF AN ELASTIC EARTH. EXTERNAL TIDAL POTENTIAL
Peter Musen Jun. 1974 29 p refs Submitted for publication
(NASA-TM-X-70743; X-920-74-202) Avail: NTIS HC $4.50 CSCL 08E

The differential equations of the tidal oscillations of the earth were established under the assumption that the interior of the earth is laterally inhomogeneous. The theory was developed using vectorial and dyadic symbolism to shorten the exposition and to reduce the differential equations to a symmetric form convenient for programming and for numerical integration. The formation of tidal buldges on the surfaces of discontinuity and the changes in the internal density produce small periodic variations in the exterior geopotential which are reflected in the motion of artificial satellites. The analoques of Love elastic parameters in the expansion of exterior tidal potential reflect the asymmetric and inhomogeneous structure of the interior of the earth. Author

N74-32784*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE GLOBAL CHARACTERISTICS OF ATMOSPHERE EMISSIONS IN THE LOWER THERMOSPHERE AND THEIR AERONOMIC IMPLICATIONS
Edith I. Reed and Sushil Chandra Aug. 1974 36 p refs Submitted for publication Original contains color illustrations
(NASA-TM-X-70748; X-621-74-246) Avail: NTIS HC $5.00 CSCL 04A

The green line of atomic oxygen and the Herzberg bands of molecular oxygen as observed from the OGO-4 airglow photometer are discussed in terms of their spatial and temporal distributions and their relation to the atomic oxygen content in the lower thermosphere. Daily maps of the distribution of emissions show considerable structure (cells, patches, and bands) with appreciable daily changes. When data are averaged over periods of several days in length, the resulting patterns have occasional tendencies to follow geomagnetic parallels. The Seasonal variations are characterized by maxima in both the Northern and Southern Hemispheres in October, with the Northern Hemisphere having substantially higher emission rates. Formulae are derived relating the vertical column emission rates of the green line and the Herzberg bands to the atomic oxygen peak density. Global averages for the time period for these data (August 1967 to January 1968), when converted to maximum atomic oxygen densities near 95 km, have a range of 2.0 x 10 to the 11th power/cu cm 2.7 x 10 to the 11th power/cu cm. Author

N74-32785*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN ANALYSIS OF FRACTURE TRACE PATTERNS IN AREAS OF FLAT-LYING SEDIMENTARY ROCKS FOR THE DETECTION OF BURIED GEOLOGIC STRUCTURE
Melvin H. Podwysocki Jun. 1974 85 p refs Submitted for publication
(NASA-TM-X-70742; X-923-74-200) Avail: NTIS HC $7.25 CSCL 08G

Two study areas in a cratonic platform underlain by flat-lying sedimentary rocks were analyzed to determine if a quantitative relationship exists between fracture trace patterns and their frequency distributions and subsurface structural closures which might contain petroleum. Fracture trace lengths and frequency (number of fracture traces per unit area) were analyzed by trend surface analysis and length frequency distributions also were compared to a standard Gaussian distribution. Composite rose diagrams of fracture traces were analyzed using a multivariate analysis method which grouped or clustered the rose diagrams and their respective areas on the basis of the behavior of the rays of the rose diagram. Analysis indicates that the lengths of fracture traces are log-normally distributed according to the mapping technique used. Fracture trace frequency appeared higher on the flanks of active structures and lower around passive reef structures. Fracture trace log-mean lengths were shorter over several types of structures, perhaps due to increased fracturing and subsequent erosion. Analysis of rose diagrams using a multivariate technique indicated lithology as the primary control for the lower grouping levels. Groupings at higher levels indicated that areas overlying active structures may be isolated from their neighbors by this technique while passive structures showed no differences which could be isolated. Author

N74-32786# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
ON THE EFFECTS OF GRAVITATIONAL FIELD ON THE TURBULENT TRANSPORT OF HEAT AND MOMENTUM
B. E. Lauder Mar. 1974 30 p refs
(HTS/74/9) Avail: NTIS HC $4.50

A simple way of approximating the role of pressure fluctuations in the equations for the transport of Reynolds stress and heat flux is presented. Allowance is made for the way the gravitational field affects the pressure interactions. Then, under the assumption of local isotropy and with Rodi's (1972) proposals for eliminating transport terms, a pair of algebraic equations for the Reynolds-stress and heat-flux correlations is obtained. The model predicts Webster's (1964) stably stratified shear flow quite accurately, the critical flux Richardson being approximately 0.3 in a free shear flow with turbulence energy generation and dissipation rates in balance. Author

N74-32787# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
THE MATHEMATICAL MODELLING OF RIVERS
D. B. Spalding Jan. 1974 36 p refs
(HTS/74/4) Avail: NTIS HC $5.00

A calculation procedure, already tested in flows within engineering equipment, is being applied to the mathematical

modelling of rivers. The procedure solves the governing differential equations numerically, and so predicts the three-dimensional distributions of water velocity (three components), temperature, turbulence energy and scale, oxygen content, and other practically-interesting variables. Because a marching-integration technique is used, only two-dimensional computer storage is needed, even though the flow process is three-dimensional. Special features of the computer program incorporating the method are: a stretching grid, which accomodates itself to changing width and depth of the river along its length; and a curved boundary treatment, allowing changes in bed profile to be incorporated.
Author

N74-32788*# Texas Univ., Dallas.
STATISTICAL THEORY AND METHODOLOGY FOR REMOTE SENSING DATA ANALYSIS Final Report, 1 Jun. 1973 - 31 May 1974
Patrick L. Odell 1 Jun. 1974 196 p refs
(Contract NAS9-13512)
(NASA-CR-134394; JSC-08971) Avail: NTIS HC $13.00 CSCL 05B

A model is developed for the evaluation of acreages (proportions) of different crop-types over a geographical area using a classification approach and methods for estimating the crop acreages are given. In estimating the acreages of a specific croptype such as wheat, it is suggested to treat the problem as a two-crop problem: wheat vs. nonwheat, since this simplifies the estimation problem considerably. The error analysis and the sample size problem is investigated for the two-crop approach. Certain numerical results for sample sizes are given for a JSC-ERTS-1 data example on wheat identification performance in Hill County, Montana and Burke County, North Dakota. Lastly, for a large area crop acreages inventory a sampling scheme is suggested for acquiring sample data and the problem of crop acreage estimation and the error analysis is discussed. Author

N74-32789*# Applied Science Associates, Inc., Apex, N.C.
ENGINEERING STUDIES RELATED TO THE SKYLAB PROGRAM. TASK H: MICROWAVE/OPTICAL/INFRARED IMAGE PROCESSING FOR OCEAN CURRENT RECOGNITION Final Report
A. G. Smith Jul. 1974 49 p refs
(Contract NAS6-2307)
(NASA-CR-137468) Avail: NTIS HC $5.50 CSCL 08C

Images from the Skylab S-193 radar aitimeter were selected from data obtained on appropriate passes made by Skylabs 2, 3, and 4 missions for the following three objectives: (1) to serve as a precursor to an investigation for the planned GEOS-C mission, in which radar altimeter data will be analyzed to reveal ocean current related to surface topography; (2) to determine the value of satellite infrared and visual radiometer data as potential sources of ground truth data, the results of which be incorporated in the planning of the SEASAT program; and (3) to determine whether optimal data reduction techniques are useful for revealing clues on Gulf Stream topographic signature characteristics. The results obtained which apply to the stated objectives are discussed. Author

N74-32790*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SILICON IONS BELOW 100 km: A CASE FOR SiO2(+)
Richard A. Goldberg Aug. 1974 14 p refs Submitted for publication
(NASA-TM-X-70751; X-912-74-251) Avail: NTIS HC $4.00 CSCL 04A

Silicon ions are normally detected at altitudes above 100 km and within sporadic E layers. Traces have rarely been observed within the more permanent metallic layer near 93 km. This is surprising since silicon is an important constituent of chondritic meteorites, which ablate material in this region to provide a primary source of the metallic species observed there. Evidence is presented that Si(+)ions form SiO2(+) at the lower altitudes, and exist in this ionic state prior to recombination. A rocket launched from El Arenosillo, Spain on 3 July 1972, at 0743 LMT, during the predicted period of the Beta Taurids meteor shower, passed through a continuous belt of metallic ions that began near 85 km, ended near 115 km, and exhibited an order of magnitude increase in the form of a layer near 114 km. Si(+)was measured in and below the ledge down to 103 km. It showed a rapid decrease below this height. Radiative association is offered as a primary mechanism for SiO2(+) production.
Author

N74-32791*# Nevada Univ., Las Vegas. Dept. of Biological Sciences.
IN SITU DETECTION OF MICROBIAL RESPIRATION IN SOILS AND SALT FLATS Interim Report
Richard W. Tew 20 Mar. 1973 15 p refs
(Grant NGR-29-001-039)
(NASA-CR-140009) Avail: NTIS HC $4.00 CSCL 06M

Increase in CO2 partial pressures over a desert soil treated with casamino-acids glucose solution correlated with bacterial growth. Few or no increases in numbers of bacteria or CO2 concentrations were noted in similar plots treated with water only or receiving no treatment. Growth in the soil appeared to be severely nutrient limited during the 10 day experiment. Especially rapid growth took place between the third and fifth day, when temperatures ranged from 0 deg. (night) to a maximum of 17.4 deg. (day). Under the conditions of the experiment, intermittent CO2 assay was an insensitive indicator of growth, possibly because of restiction of gas escape by the desert pavement or solution, exchange, or precipitation of carbonate, but more likely because of inefficient sealing of hoods to and below the soil surface. CO2 assay was unable to detect microbial successions. The unpredictable course of these successions, plus unpredictable relative retentions mitigates against assay of organic gases as reliable in situ detection of microbial activity, except perhaps in very alkaline environments such as Owens Lake salts.
Author

N74-32792*# Lockheed Electronics Co., Houston, Tex.
EVALUATION OF COMPUTER-AIDED PROCEDURE FOR DETECTING SURFACE WATER
Aug. 1973 64 p refs
(Contract NAS9-12200)
(NASA-CR-140214; JSC-08453) Avail: NTIS HC $6.25 CSCL 08H

Results from an evaluation of a computer-aided procedure for processing ERTS-1 data to detect and locate surface water are presented. The procedure was evaluated using data from a study area in the vicinity of the Lake Somerville area in Washington County, Texas. The procedure consisted of (1) selecting water training fields, (2) aggregating the training samples together and clustering them into unimodal clusters, (3) computing the mean vector and covariance matrix for each cluster, (4) classifying all of the study area into classes corresponding to the clusters using the maximum likelihood classifier, and (5) thresholding out the nonwater pixels.
Author

N74-32793*# Lockheed Electronics Co., Plainfield, N.J.
DEVELOPMENT OF A TWO CHANNEL LINEAR DISCRIMINANT FUNCTION FOR DETECTING AND IDENTIFYING SURFACE WATER USING ERTS-1 DATA
Aug. 1973 36 p
(Contract NAS9-122000)
(NASA-CR-140221; JSC-08450) Avail: NTIS HC $5.00 CSCL 08H

A method for detecting surface water using ERTS-1 multispectral scanner digital data is described. The several computer programs for processing multispectral data are described, along with the manner in which these programs were used. The use of the LARSAA program to test and demonstrate the discriminant function is explained. The discriminant function itself was later implemented in an operational program which performs only those specific operations necessary to test each data point for an indication of surface water in the scene. Several possible sources of difficulty in the use of the function are identified, and suggestions are made for avoiding or correcting those difficulties.
Author

N74-32794*# Lockheed Electronics Co., Plainfield, N.J.
DEVELOPMENT OF A COMPUTER-AIDED PROCEDURE FOR THE NATIONAL PROGRAM OF INSPECTION OF DAMS
Aug. 1973 49 p ref
(Contract NAS9-12200)

(NASA-CR-140220; JSC-08449) Avail: NTIS HC $5.50 CSCL 08H

An effort was undertaken to determine the utility of ERTS-1 MSS data, together with automatic data processing (ADP) techniques, to detect and locate surface water, and transfer the related technology to the Texas Water Rights Commission (TWRC). A test site was selected, ERTS-1 MSS and ancillary data obtained, and existent ADP classification programs applied. During the course of this effort a linear discriminant function was developed. The results were evaluated for potential candidates for a transferable procedure. A computer-aided technique using a linear discriminant function was selected and recommended, for inclusion in an operational system, which met detection and location criteria. Specifically, evaluation of the selected computer-aided procedure for the test site resulted in the detection of 100 percent of areas of surface water 10 acres or greater in areal extent and the geographic location of areas classified as water to a positional accuracy of 1000 feet or closer. The procedure was recommended for inclusion in an operational computer-aided procedure for transfer to TWRC. Author

N74-32795*# Lockheed Electronics Co., Houston, Tex.
PROCEDURES MANUAL FOR DETECTION AND LOCATION OF SURFACE WATER USING ERTS-1 MULTISPECTRAL SCANNER DATA. VOLUME 1: SUMMARY
Dec. 1973 54 p refs
(Contract NAS9-12200)
(NASA-CR-140215; JSC-08454-Vol-1-Rev-A) Avail: NTIS HC $5.75 CSCL 08H

Resource requirements for implementation of computer aided detection and location of surface water using ERTS 1 multispectral band scanner data are cited, along with suggestions for operational use of the information derived from the procedure. A summary is also provided for the separate program elements of data acquisition, control network establishment, computer program description and user's guide, and information correlation and interpretation. A.A.D.

N74-32796*# Lockheed Electronics Co., Houston, Tex.
PROCEDURES MANUAL FOR DETECTION AND LOCATION OF SURFACE WATER USING ERTS-1 MULTISPECTRAL SCANNER DATA. VOLUME 2: DATA ACQUISITION
Nov. 1973 34 p refs
(Contract NAS9-12200)
(NASA-CR-140216; JSC-08638-Vol-2) Avail: NTIS HC $4.75 CSCL 08H

The various ERTS 1 data products, recommended selection criteria, and screening aids are presented for use with a computer aided technique for detection and location of surface water from multispectral band scanner data. The maps of different types and scales which are needed during several phases of the procedure are discussed in terms of their functional requirements, series availability, and output considerations. Guidelines governing the availability of data, and procedures for ordering all data and ancillary information are outlined. Author

N74-32797*# Lockheed Electronics Co., Houston, Tex.
PROCEDURES MANUAL FOR DETECTION AND LOCATION OF SURFACE WATER USING ERTS-1 MULTISPECTRAL SCANNER DATA. VOLUME 3: CONTROL NETWORK ESTABLISHMENT
Nov. 1973 53 p refs
(Contract NAS9-12200)
(NASA-CR-140217; JSC-08451-Vol-3) Avail: NTIS HC $5.75 CSCL 08H

Multispectral digital data characteristics, and the criteria for establishing a control network are discussed as necessary elements in the implementation of a computer aided program for detection and location of surface water using ERTS 1 multispectral band scanner (MSS) data. The transformation of MSS data into a static, earth oriented coordinate system is described, and the approximate coefficients derived from system measurements of spacecraft orbit and attitude, and of scanner geometry, are given. Author

N74-32798*# Lockheed Electronics Co., Houston, Tex.
PROCEDURES MANUAL FOR DETECTION AND LOCATION OF SURFACE WATER USING ERTS-1 MULTISPECTRAL SCANNER DATA. VOLUME 4: COMPUTER PROGRAM DESCRIPTION AND USER'S GUIDE
Nov. 1973 233 p refs
(Contract NAS9-12200)
(NASA-CR-140218; JSC-08452-Vol-4) Avail: NTIS HC $14.75 CSCL 08H

The detection and mapping (DAM) package of computer programs designed for use with a project to detect and locate surface water from ERTS 1 multispectral band scanner (MSS) data is described, and a user's manual is provided to document the operation of each program in the package. Computer generated display of MSS data is considered, along with control network adjustments, and classification and mapping of ERTS 1 data. An in depth discussion of the computer input deck setup associated with each program is provided. A.A.D.

N74-32799*# Lockheed Electronics Co., Houston, Tex.
PROCEDURES MANUAL FOR DETECTION AND LOCATION OF SURFACE WATER USING ERTS-1 MULTISPECTRAL SCANNER DATA. VOLUME 5: INFORMATION CORRELATION AND INTERPRETATION
Nov. 1973 41 p refs
(Contract NAS9-12200)
(NASA-CR-140219; JSC-08639-Vol-5) Avail: NTIS HC $5.00 CSCL 08H

A detailed discussion is presented of the steps involved with the manual processing of the output from the computer programs associated with the detection and location of surface water with ERTS 1 multispectral band scanner data. A description of the methodology required for correlation of the acquired information to base maps, and a discussion related to the interpretation of the correlated information as it pertains to the National Program of Inspection of Dams are also provided. Author

N74-32800*# Kanner (Leo) Associates, Redwood City, Calif.
OUR EXPERIENCES IN THE POSSIBLE USE OF THE ELECTRON MICROSCOPE IN SOIL STUDY EXPERIMENTS
G. Partay Washington NASA Sep. 1974 19 p refs Transl. into ENGLISH from Agrokem. Talajtan (Hungary), v. 22, no. 3-4, 1973 p 389-399
(Contract NASw-2481)
(NASA-TT-F-15872) Avail: NTIS HC $4.00 CSCL 08M

The use of electron microscopy in soil study research was studied with respect to general preparatory methods and the problems of evaluating pictures. The method of ultrasonic disintegration was developed and used, and descriptions of some structural observations which aid in the identification of major soil components are presented. Author

N74-32801# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORTS ON MAPPING AND TOPOGRAPHIC MEASUREMENTS. SERIES 1: ORIGINAL CONTRIBUTIONS, ISSUE NO. 62 [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN. REIHE 1: ORIGINALBEITRAEGE, HEFT NR. 62]
1974 114 p In GERMAN; ENGLISH summary
Avail: NTIS HC $8.75

Instructions for the operation of the GZ1 orthoprojector in storage mode are given, namely for the preparation of orthophotos either with or without sheet lines, as well as with or without junction of models. The following procedures are described for the different combinations of Zeiss equipment: (1) profile measurement by means of the C 8 stereoplanigraph and profile scribing by SG 1 storage unit; (2) profile measurement by planimat and profile scribing by SG 1 storage unit; (3) projection of the orthophoto and of the dropped lines GZ 1 orthoprojector and LG 1 scanning unit, as well as by HS dropped line attachment; and (4) projection of the orthophoto and of the contour lines by GZ 1 orthoprojector 1/O-Int optical interpolation system and HLZ electronic contourliner. Author

N74-32802*# Pennsylvania State Univ., University Park. Ionospheric Research Lab.
A SIMPLE RADIATIVE TRANSFER MODEL OF THE HIGH LATITUDE MESOSPHERIC SCATTERING LAYER
John R. Hummel 15 Jul. 1974 41 p refs
(Grant NGL-39-009-003)

(NASA-CR-139687; PSU-IRL-SCI-428; SR-428) Avail: NTIS HC $5.25 CSCL 04A

A simple radiative transfer model of the particle layer found at 85 km over the summer poles is presented. The effects of the layer on the global radiative temperature, the polar region temperature, and the greenhouse effect are discussed. The estimated magnitude of the global radiative temperature change is 3.5 x .001 K to 2.2 x .01 K, depending on the value of the imaginary part of the particle index of refraction. The layer is shown to have a possible secondary influence on the temperature of the polar region while the contribution which the layer makes to the greenhouse effect is shown to be negligible. The imaginary part of the particle index of refraction is shown to be important in determining the attenuation properties of the layer. Author

N74-32803*# Kanner (Leo) Associates, Redwood City, Calif.
BIOLOGICAL MOBILIZATION OF PHOSPHORUS AND NITROGEN IN INUNDATED SOILS USED FOR GROWING RICE
A. N. Ilyaletdinov Washington NASA Sep. 1974 21 p refs Transl. into ENGLISH from Izv. Akad. Nauk Kaz. SSR, Ser. Biol. (USSR), v. 8, no. 2, 1970 p 19-28
(Contract NASw-2481)
(NASA-TT-F-15926) Avail: NTIS HC $4.25 CSCL 08M

Accumulation of acid-soluble phosphorus and iron, hydrogen sulfide and sulfate-reducing bacteria in the soil was investigated. It was found that oxidation activities of microorganisms favor reduction in solution of iron and conversion of phosphorus to the free forms, in swampy meadow carbonate soils in a district of Kazakhstan. Tests using organic matter, in the form of alfalfa roots, in moderately wetted and inundated soil demonstrated a high microorganism population and low ammonia and easily hydrolyzed nitrogen content in moderately wetted soil, as well as suppression of microorganism growth and continually increasing content of available forms of nitrogen in inundated soils. Low ammonia concentration is likely due to assimilation of ammonia by microbes, nitrification and fixation of soil ammonia. Further tests were run on various combinations of soil, nitrogen, alfalfa root and mineral phosphate, on inundation of soil at various times before sowing rice. Author

N74-32804*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
SKYLAB-3 HANDHELD PHOTOGRAPHY ALPHABETIZED GEOGRAPHICAL FEATURES LIST
Jackye L. McNiel and C. C. DeYalcourt Apr. 1974 92 p
(Contract NAS9-12200)
(NASA-CR-140244; LEC-3213) Avail: NTIS HC $7.75 CSCL 05B

The data was thoroughly researched using the Times Index-Gazetteer of the World, the Times Atlas of the World, and the National Atlas of the United States of America to ensure correct spelling and location of named features. The spelling and major geographical features applied to smaller features (minor) such as cities, towns, mountain peaks, etc., are in accordance with these publications. It is understood that some political boundaries and names of countries are subject to change. The data was written on NASA keypunch transmittal sheets and punched into data cards. These data cards were then machine sorted alphabetically by major feature and minor feature. Author

N74-32805*# Caspan Corp., Houston, Tex.
SCREENING, CATALOGING AND INDEXING OF EARTH RESOURCE AIRCRAFT MISSIONS Final Report
Sep. 1974 8 p
(Contract NAS9-13604)
(NASA-CR-140239) Avail: NTIS HC $4.00 CSCL 05B

Data obtained from 30 earth resources aircraft missions, flown between September 1, 1973 and September 1, 1974, were screened, cataloged, and indexed using microfilm copy. The manhours required for completing the task are presented, and problems encountered during the project are reported. It is concluded that a cataloging and indexing report of remote sensor data can be prepared on a timely basis for a relatively low cost from microfilm. Recommendations are given in order to further facilitate the task. A.A.D.

N74-32806*# Techtran Corp., Glen Burnie, Md.
MULTISPECTRAL SCANNING SYSTEM IN AN AIRCRAFT EXPERIMENT TO RESEARCH EARTH RESOURCES
G. A. Avanesov, I. V. Barinov, and V. D. Glazkov Washington NASA Sep. 1974 11 p Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 4, Apr. 1974 p 30-36
(Contract NASw-2485)
(NASA-TT-F-15684) Avail: NTIS HC $4.00 CSCL 14B

The systems comprising a preliminary model of the experimental complex for acquisition and processing of video information are described. Preliminary results of the experiment are given. Author

N74-32807*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
BARIUM CLOUD EVOLUTION AND STRIATION FORMATION IN THE MAGNETOSPHERIC RELEASE ON SEPTEMBER 21, 1971
David Adamson and Clifford L. Fricke Washington Sep. 1974 45 p refs
(NASA-TN-D-7722; L-9668) Avail: NTIS HC $3.25 CSCL 04A

The joint NASA-Max Planck Institute Barium Ion Cloud (BIC) Experiment on September 21, 1971 involved the release of 1.7 kg of neutral barium at an altitude of 31,500 km at a latitude of 6.93 deg N. and a longitude of 74.40 deg W. A theoretical model describing the barium neutral cloud expansion and the ion cloud formation is developed. The mechanism of formation of the striational features observed in the release is also discussed. Two candidate instabilities, which may contribute to striation formation, are examined. The drift instability stemming from the outwardly directed drag force exerted on the ions by the outstreaming neutrals is rejected on the grounds that the ion density is too low during the collision-dominated phase of the cloud expansion to support this kind of instability. The joint action of Rayleigh-Taylor and flute instabilities plausibly accounts for the observed striational structure. This same mechanism may well be operative at times of sudden injection of plasma into the inner magnetosphere during geomagnetic storms and may thus contribute to the formation of field-alined inhomogeneities which serve as whistler ducts. Author

N74-32808*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A NEW APPROACH TO MASS SPECTROMETER MEASUREMENTS OF THERMOSPHERIC DENSITY
Leonard T. Melfi, Jr., F. J. Brock (Old Dominion Univ.), and Clarence A. Brown, Jr. Washington Sep. 1974 34 p refs
(NASA-TN-D-7711; L-9553) Avail: NTIS HC $3.25 CSCL 04A

The gas sampling problem in satellite and high velocity probes was investigated by applying the theory of a drifting Maxwellian gas. A lens system using a free stream ion source was developed and experimentally evaluated over the pressure range of 0.00001 to 0.01 N/m sq (approx. 10 to the minus 7th power to 0.0001 torr). The source has high beam transparency, which minimizes gas-surface collisions within, or near, the ionization volume. It is shown that for high ion energy (60 eV), the extracted ion beam has an on-axis energy spread of less than 4 eV, and that 90 percent of the ions are within 2.5 deg of the beam axis. It is concluded that the molecular beam mass spectrometer concept, developed for gas density measurements in the upper atmosphere, substantially reduces gas-surface scattering and gas-surface reactions in the sample, and preserves the integrity of the gas sample during the analysis process. Studies show that both the Scout and Delta launch vehicles have adequate volume, control, velocity, and data acquisition capability necessary to obtain thermospheric number density in real time. Author

N74-32809*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
BURKE COUNTY WHEAT FEASIBILITY STUDY
W. A. Kunkel Jun. 1974 17 p
(Contract NAS9-12200)
(NASA-CR-140249; LEC-3783) Avail: NTIS HC $4.00 CSCL 02C

A feasibility study was conducted to determine whether wheat could be distinguished from other small grain crops in a selected

spring wheat growing area in Burke County, North Dakota using a maximum likelihood classification program and ERTS 1 multispectral band scanner data. ERTS 1 data scenes were selected from passes made on June 5, 1973 and June 23, 1973. The Univac 1108 computer and the LARSYS pattern recognition software package were used in performing the classification. Results of the analysis are provided. Author

N74-32810*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
FEASIBILITY FOR IDENTIFICATION OF WHEAT IN HILL COUNTY, MONTANA
L. M. Flores Jun. 1974 28 p
(Contract NAS9-12200)
(NASA-CR-140248; LEC-3860) Avail: NTIS HC $4.50 CSCL 02C

Hill County, Montana was the site chosen for feasibility studies concerning wheat crop identification using ERTS 1 multispectral band scanner data, in which the specific objective was to determine whether wheat is spectrally separable from other crops which are typically grown in wheat producing areas. Available computerized techniques were evaluated for their utility in the investigation. It was found that wheat can be separated from other crops with a classification accuracy of roughly 90 percent or better, and that the best single data set occurs after wheat is fully headed and before it turns yellow. The best overall performance was obtained using the three-pass data set using the best 8 channels, or all 12 channels. A.A.D.

N74-32811# European Space Research Organization, Paris (France).
THE IMPLICATIONS FOR EUROPEAN SPACE PROGRAMMES OF THE POSSIBILITIES OF MANNED MISSIONS. 4: EARTH RESOURCES
1973 430 p refs Proc. of the ESRO Summer School 1973 4 Vol.
Avail: NTIS HC $24.50

The application of remote sensing for global observation from spacelab is discussed in great detail. Contributions are classified into introductory papers, sensors for spacelab, earth science applications, data processing aspects, and spacelab payload aspects. Remote sensing techniques involve photography, multispectral scanning, passive microwave techniques, and side-looking radar. Geology, geography, hydrology, oceanography, and fishery are dealt with as earth science applications. For individual titles, see N74-32812 through N74-32829.

N74-32812 Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung, Munich (West Germany).
INTRODUCTION. OVERALL OBJECTIVE OF EARTH RESOURCES SURVEYS
J. Bodechtel *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 10 p (For availability see N74-32811 22-13)

Tasks concerning global earth observation by spaceborne remote sensing techniques are discussed. Ground, airborne, and spaceborne observation from platforms is discussed and the role of spacelab in a remote sensing program is defined. ESRO

N74-32813 Kansas Univ., Lawrence. Remote Sensing Lab.
PHYSICS OF REMOTE SENSING **c14**
Richard K. Moore *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 37 p (For availability see N74-32811 22-13)

Classification of sensors in terms of sources, wavelengths, and methods for obtaining resolution is discussed. Mechanisms for emission and scatter are dealt with and atmospheric effects are elaborated upon. Methods for achieving resolution are presented. ESRO

N74-32814 European Space Research Organization, Paris (France).
EARTH RESOURCES AND MANNED SPACE SYSTEMS. THE ROLE FOR SPACELAB **c14**
J. Plevin *In its* The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 17 p refs (For availability see N74-32811 22-13)

The history of manned space flights, with particular reference to earth observations, is reviewed. The role of spacelab for earth resources surveys is outlined, notably in regard to shuttle and sortie missions. Earth resources payloads, including facility sensors such as side-looking radar, passive microwave sensors and multispectral scanners, standard support sensors, and experimental sensors are discussed. ESRO

N74-32815* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EARTH RESOURCES SURVEYS FROM SPACELAB
O. Glen Smith *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 15 p (For availability see N74-32811 22-13)

The use of the space shuttle and of spacelab in earth resources surveys is reviewed. Advantages for viewing earth resources from space are summarized and research and development requirements are dealt with. Man's role in spacelab and shuttle operations is discussed and flight schedules are tabulated. ESRO

N74-32816 Physics Lab. RVO-TNO, The Hague (Netherlands).
GENERAL ASPECTS OF THE TECHNOLOGY OF REMOTE SENSING. AN INTRODUCTION **c14**
G. P. deLoor *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 25 p refs (For availability see N74-32811 22-13)

Remote sensing of earth resources from aircraft is discussed. Imaging techniques are dealt with. Criteria for observation are given and several examples of images are discussed. ESRO

N74-32817 European Space Research Organization, Paris (France).
PHOTOGRAPHY AND SPACELAB APPLICATION **c14**
R. Haydn *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 28 p refs (For availability see N74-32811 22-13)

The role of photography in spacelab is discussed, notably in regard to: (1) the spectral domain of photography; photographic film, photographic filters, monoband photography, multiband photography; and (2) the geometric domain of photography; the focus of the lens system. Spacelab as a data storage platform is reviewed and evaluation techniques of photographic data are dealt with. ESRO

N74-32818 Plessey Co., Ltd., Havant (England).
THE APPLICATION OF MULTISPECTRAL SENSING TO THE EUROPEAN SPACELAB PROJECT
A. D. Higham *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 23 p (For availability see N74-32811 22-13)

The use of multispectral sensing in the European spacelab project is dealt with. The sensing process is described and typical multispectral sensors are discussed. Spectral characteristics of vegetation, rocks, water, soils, and their variation with environmental parameters are describes. Basic data processing methods and the types of facilities necessary to utilize multispectral sensing data are dealt with, and applications of multispectral sensing are indicated. ESRO

N74-32819 Saab-Scania, Linkoping (Sweden).
PASSIVE MICROWAVE TECHNIQUES AND SPACELAB APPLICATIONS
E. Ohlsson *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 34 p refs (For availability see N74-32811 22-13)

Physics, material properties, and technology of passive microwave radiometry are discussed. Geoscientific requirements are dealt with and spacelab applications are indicated. ESRO

N74-32820 Elliott-Automation Space and Advanced Military Systems, Ltd., Camberley (England).
SIDE-LOOKING RADAR AND SPACELAB EARTH RESOURCES SURVEY APPLICATIONS
S. R. Dauncey *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 24 p (For availability see N74-32811 22-13)

The basic concept of real aperture side-looking radar (SLR) is introduced, including brief comments on the processing required, leading to the concept of synthetic aperture radar. Handling of

SLR data is discussed and spaceborne applications are indicated. Earth science applications of SLR are dealt with. ESRO

N74-32821 Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung, Munich (West Germany).
SPACELAB APPLICATION IN GEOLOGY, GEOGRAPHY, HYDROLOGY
J. Bodechtel *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 15 p (For availability see N74-32811 22-13)

The main tasks for spaceborne geological observation are outlined and examples of satellite photographs are given. The principal possibilities for spaceborne observations involving changing phenomena and their regional relationships in hydrology are indicated. ESRO

N74-32822 Freiburg Univ. (West Germany). Abteilung Luftbildmessung und -Interpretation.
APPLICATION OF SPACELAB TO LAND USE, FORESTRY AND AGRICULTURE
G. Hildebrandt *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 16 p refs (For availability see N74-32811 22-13)

An operational inventory system of land use, natural and cultivated vegetation is considered. Included are; information required, useful and usable parameters to get the information by remote sensing, and the information that will be available by advanced remote sensing from space platforms. The experience gained from spectrophotometric analysis of spaceborne images is discussed in detail. ESRO

N74-32823 Deutsches Hydrographisches Institut, Hamburg (West Germany).
OCEANOGRAPHY, FISHERY
K. Struebing *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 18 p refs (For availability see N74-32811 22-13)

The use of remote sensors for determining oceanographic parameters is discussed, including coastal zone processes, water pollution, organic matter, ocean color, sea surface temperature, sea surface salinity, sea state, sea surface altimetry, tides, sea ice, and icebergs. The topic of remote sensors in fisheries research involves direct methods, such as visual range cameras and infrared imagery, and indirect methods such as oil slicks, chlorophyll, and image intensifiers. Environmental effects on fish and man are dealt with. ESRO

N74-32824 Ludwig-Maximilians-Universitat, Munich (West Germany). Inst. fuer Meteorologie.
OCEAN POLLUTION AND THE OCEAN-ATMOSPHERE SYSTEM
H.-J. Bolle *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 22 p refs (For availability see N74-32811 22-13)

The influence of atmospheric constituents on the remote sensing of the ocean surface is discussed. Irradiance at the sea surface is dealt with and reflection at the sea surface is treated mathematically. The penetration of light into the ocean is detailed and the upwelling flux in the ocean is discussed. Modulation of the return signal by the atmosphere is discussed and special topics such as detection of oil slicks and photoplankton recognition are elaborated. ESRO

N74-32825 Telespazio, S.p.A., Rome (Italy).
ON-BOARD AND GROUND DATA PROCESSING IN SPACELAB FOR EARTH RESOURCES c08
G. Bressanin *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 35 p refs (For availability see N74-32811 22-13)

Processing of spacelab earth resources data onboard and on the ground is discussed. Onboard data handling includes data acquisition, recording and storage, sensor monitoring and control, and data analysis. Data processing on the ground involves data handling, data compression, geometric transformations, image data preprocessing, pattern recognition, digital, optical, analog electronic and hybrid processing implementation, and data storage and retrieval. ESRO

N74-32826 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
METHODS OF ANALOGUE AND DIGITAL IMAGE ANALYSIS c14
P. Hartl *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 46 p (For availability see N74-32811 22-13)

Image data analysis techniques are dealt with. Filtering processes, including spatial frequency filtering, direction filtering, matched filtering, density slicing, filtering of specific hues, averaging over multispectral images, and ratio mapping, are detailed. Enhancement processes are discussed. A feature recognition classification is outlined and decision rules are elaborated, notably Bayes criterion and maximum likelihood rule, quadratic and linear decision rule and nonparametric pattern recognition. Processing methods for data analysis are indicated. ESRO

N74-32827 Laboratori della Geofisica della Litosfera, Milan (Italy).
GEOSCIENTIFIC INTERPRETATION OF REMOTELY SENSED DATA
R. Cassinis *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 16 p (For availability see N74-32811 22-13)

Earth observation from space is divided into dynamic phenomena and static features. Examples of ERTS-1 images over Italy are discussed. Ground truth collection and seasonal factors are indicated and the possible use of spacelab for earth observations is outlined. ESRO

N74-32828 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
EARTH RESOURCES PAYLOADS FOR THE SPACELAB
D. Davidts *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 28 p (For availability see N74-32811 22-13)

A European earth resources payload for spacelab is detailed. The payload definition procedure, including feedback process, user requirements, spacelab missions, and mission analysis, is discussed. Shuttle/spacelab system capabilities are dealt with, notably a turnaround and mission model. The earth observation payload, involving payload elements and payload accommodation, is discussed. ESRO

N74-32829 Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung, Munich (West Germany).
[USE OF SPACELAB FOR EARTH OBSERVATION. CONCLUSIONS]
J. Bodechtel *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 6 p (For availability see N74-32811 22-13)

The role of spacelab in global monitoring with remote sensors is reviewed. ESRO

N74-32830# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Feb. 1974 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE]
Feb. 1974 31 p In FRENCH and DUTCH
Avail: NTIS HC $4.75

Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabulated for February 1974. ESRO

N74-32831# Royal Netherlands Meteorological Inst., De Bilt.
YEARBOOK B, NUMBER 120: GEOMAGNETISM. GEOMAGNETIC OBSERVATIONS AT WITTEVEEN, 1968
1974 48 p ref
(KNMI-98) Avail: NTIS HC $5.50; Roy. Neth. Meteorol. Inst. F 7,50

Data based on magnetic observations made at the magnetic observatory at Witteveen in the Netherlands during 1968 are presented in tabular form. ESRO

N74-32832# Israel Program for Scientific Translations, Ltd., Jerusalem.
ATMOSPHERIC RADIATION STUDIES

K. Ya. Kondratev, ed. 1974 225 p refs Transl. into ENGLISH of Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 Sponsored by US-Israel Binatl. Sci. Found.
(TT-74-50010; ISBN-0-7065-1447-5) Avail: NTIS HC $14.25

Airborne atmospheric radiation measurements for meteorological surveys and forest fire detection. For individual titles, see N74-32833 through N74-32855.

N74-32833 Israel Program for Scientific Translations, Ltd., Jerusalem.
APPLICABILITY OF A METHOD OF NUMERICAL CONVERSION FROM SATELLITE-MEASURED LUMINANCE TO UPWARD SHORT WAVE RADIATION FLUXES
N. P. Pyatovskaya *In its* Atmospheric Radiation Studies (TT74-50010) 1974 p 1-13 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

Published data are used to study the conversion of satellite measured luminance to the short wave radiation flux directed outward from the earth. The angular structure of the luminance field of the earth atmosphere system is determined from actual luminance values recorded by meteorological satellites of the Cosmos and Meteor series. Classifications are suggested on the basis of satellite viewed types of reflection from clouds, and a logical scheme is presented for refining the method of processing data on the intensity of upward short wave radiation when calculating the upward short wave radiation flux. Author

N74-32834 Israel Program for Scientific Translations, Ltd., Jerusalem.
ALBEDO OF THE EARTH-ATMOSPHERE SYSTEM FOR CLEAR AND OVERCAST SKIES
N. P. Pyatovskaya *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 14-27 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

The results are reported of determining the albedo of the earth atmosphere system, albedo of the underlying surface, short wave radiation balance and radiative heating of the vertical column of the atmosphere due to absorption of solar radiation. The calculations are conducted for clear and overcast skies with the aid of data obtained from narrow viewing angle radiometers with narrow angle of sight installed aboard Cosmos and Meteor satellites. Use was made of actinometric information in the 0.3 to 3 micron channel and TV photographs obtained at the same time as radiation data. Author

N74-32835 Israel Program for Scientific Translations, Ltd., Jerusalem.
SCATTER OF SATELLITE MEASURED RADIATION TEMPERATURES
L. B. Krasilshchikov, I. V. Morozova, M. G. Rudakov, and L. B. Rudneva *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 28-30 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

The permanence of reference signals is studied from the standpoint of instrument calibration and satellite operation. Random errors in calibration are assessed and shown to affect the accuracy of actinometric measurements. Author

N74-32836 Israel Program for Scientific Translations, Ltd., Jerusalem.
EFFECT OF TEMPERATURE ON THE PERFORMANCE OF AN INTERFERENCE FILTER **c14**
A. A. Kmito, V. Ya. Matveev, and I. V. Morozova *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 31-35 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

An attempt is made to clarify the effect of low temperatures on the spectral characteristics of an interference filter used in infrared equipment of Meteor satellites. The studies were conducted at filter temperatures of 19.7 and -42.0 C. Author

N74-32837 Israel Program for Scientific Translations, Ltd., Jerusalem.
SPECTRAL RELATIONSHIPS BETWEEN OUTGOING RADIATION AND VERTICAL TEMPERATURE IN THE ATMOSPHERE IN THE 3-19 MICRON INFRARED SPECTRAL REGION
V. F. Zhvalev, K. Ya. Kondratev, and N. E. Ter-Markaryants *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 36-44 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

Calculated spectra of outgoing radiation in the 3 to 19 micron range pertaining to various areas of the U.S.S.R. are used to estimate the contribution of atmospheric layers to the outgoing radiation at intervals of 0.1 micron. Vertical profiles are obtained of weighting functions, the analysis of which made it possible to determine those atmospheric layers which make the maximum contribution to outgoing radiation in the 7.8 to 7.9, 10.4 to 10.5, 12.8 to 12.9, 13.5 to 13.6, and 18.9 to 19.0 micron regions. It is noted that a close linear relationship exists between the outgoing radiation in the 10.4 to 10.5, 12.8 to 12.9 and 13.5 to 13.6 micron intervals and the temperature at the 850-mb and 500-mb underlying surface levels. Author

N74-32838 Israel Program for Scientific Translations, Ltd., Jerusalem.
SPECTRAL DISTRIBUTION OF THERMAL RADIATION OF THE ATMOSPHERE UNDER STRATIFORMIS CONDITIONS
K. Ya. Kondratev, Kh. Yu. Niilisk, and R. Yu. Noorma *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 45-56 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

Spectral and vertical distributions of thermal radiation fluxes and radiant heat gains are calculated under stratiformis conditions. The cloud layer is simulated by an ideal 1-km-thick black screen. Three versions of this layer are considered, with the base at 1, 5 and 9 km. The 2,000-25 cm/1 spectral region is subdivided into 67 narrow spectral intervals. For each of these the upward, downward and effective radiation was calculated, as well as the radiant heat gains and radiative temperature variations at 25 atmospheric levels. The effect of cloudiness on radiant fluxes was found to be most important in atmospheric windows. The spectral distribution of radiant heat gains is highly variable, depending markedly on the altitude for which it was determined. The three principal cloudiness effects which induce additional heating (or cooling) of the atmosphere: (1) the boundary effect, which represents strong radiative heating at the base of the cloud layer and cooling at the cloud tops; (2) heating of the atmosphere at the ground in the transparent windows of the atmosphere; and (3) additional stratospheric cooling due to reduction in heating at 10 to 30 km in the ozone absorption band. Author

N74-32839 Israel Program for Scientific Translations, Ltd., Jerusalem.
CALCULATION OF THE ATMOSPHERIC TRANSMISSION FUNCTION FOR DIFFUSE RADIATION
Kh. Yu. Niilisk, R. Yu. Noorma, and L. E. Sammel *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 57-65 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

The feasibility is considered of refining methods for calculating thermal radiation fluxes by making allowance for the dependence of the diffusivity factor D on the amount of absorption. An estimate is made of the spectral variability of D for different absorbing masses. It was found that, for water vapor masses from 0.000001 to 10 cm, the values of D calculated for narrow spectral intervals vary within the limits of 2.0 to 1.1. The values of D decrease with increasing absorbing mass, this reduction being particularly steep in absorption bands. A variation in the effective absorbing mass of CO2 from 0.0001 to 1.000 cm involves a variation in D within the limits of 1.8 to 1.5. In all cases under study D is a function of the absorbing mass and of the absorption parameters in the given spectral interval. For this reason satisfactory correlation is observed between the diffusivity factor and the transmission function of directional radiation. On the basis of this correlation a simple method is developed for calculating refined values of the transmission function for diffuse radiation. Estimates of the errors in thermal radiation arising from a failure to make allowance for the dependence of D on absorption conditions show that the use of the average value D = 1.66 yields quite satisfactory results in determining the spectral distribution of backradiation

fluxes near the earth's surface and of upward fluxes at any altitude. On the other hand, spectral calculations of downward radiation in the free atmosphere require making allowance for the variability of D. Author

N74-32840 Israel Program for Scientific Translations, Ltd., Jerusalem.
EFFECT OF THE ATMOSPHERE ON THE ACCURACY OF MEASURING SEA SURFACE TEMPERATURE BY AIRCRAFT-BORNE RADIOMETERS **c14**
I. T. Razumovskii *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 66-69 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

The accuracy in measuring sea surface temperature by an aircraft borne radiometer is limited by the effect of the atmosphere intervening between the instrument and sea. Measurements of the temperature of the same sea surface area from different altitudes and in different spectral sections of the 7.15 to 14 micron transparent window show that the effect of the atmosphere decreases with reduction in filter passband. For a 300-m flight altitude the errors in temperature measurements in the 8 to 13.5 micron spectral region do not exceed 0.5 C. While measuring the temperature of the surface of the Gulf of Finland in May from altitudes up to 2,000 m in the 10.5 to 11.5 micron spectral region, the errors did not exceed 0.3 C; similar simultaneous measurements in the 9 to 12 micron transparent window resulted in an error of up to 0.5 C. The use of the 10.5 micron spectral section in measuring the sea surface temperature results in reducing the effect of the atmosphere and lowering the reflected radiation incident on the instrument. Author

N74-32841 Israel Program for Scientific Translations, Ltd., Jerusalem.
SPACE-TIME ANALYSIS OF UPWARD LONGWAVE RADIATION IN THE ATMOSPHERE OVER THE USSR
V. P. Galakhov *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 70-76 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

A space-time analysis is conducted of upward long wave radiation, obtained as a result of calculations for January and July for the U.S.S.R. The data obtained can be used to estimate heat fluxes in climatological problems. Author

N74-32842 Israel Program for Scientific Translations, Ltd., Jerusalem.
EXPERIMENTAL STUDY OF CLOUD RADIATION IN THE 8-12 MICRON REGION
O. I. Kasatkina, L. B. Krasilshchikov, and L. B. Rudneva *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 77-83 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

The feasibility is examined of conducting an objective study of cloudiness by investigating the radiation of clouds in the 8 to 12 micron region. It is suggested that measurements be processed by harmonic analysis, with a view to the objective identification of clouds both by day and at night. Systematic radiometer calibration also makes it possible to obtain cloud temperatures. Author

N74-32843 Israel Program for Scientific Translations, Ltd., Jerusalem.
ANGULAR DISTRIBUTION OF THE RADIATION OF CLEAR SKIES IN THE 8-12 MICRON REGION
O. I. Kasatkina *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 84-87 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

The results are presented of measurements of the angular distribution of the radiance of clear skies in the 8 to 12 micron atmospheric window, conducted at Karadag in September 1969. The measured angular relationships exhibit strong variability in the radiance of the zenith, and a radiance level at the horizon which is almost constant. The experimental curves of the angular radiance distribution is approximated by the Linke formula, yielding satisfactory agreement with experimental results for zenith angles not exceeding 80 deg. Author

N74-32844 Israel Program for Scientific Translations, Ltd., Jerusalem.
BACKRADIATION OF THE ATMOSPHERE FROM THE ZENITH IN THE 8-12 MICRON REGION
O. I. Kasatkina *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 88-92 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

The results are presented of radiance measurements of clear skies in the zenith in the 8 to 12 micron region, conducted in summer 1969 at Voeikovo and Karadag and in summer 1970 at Voeikovo. It is shown that the correlation between zenith radiance and surface air humidity and temperature is poor, while the correlation with atmospheric moisture content is somewhat better. The latter manifests itself only beneath very clear skies. Author

N74-32845 Israel Program for Scientific Translations, Ltd., Jerusalem.
SOME RESULTS OF AIRCRAFT MEASUREMENTS OF RADIANT FLUXES AT DIFFERENT TROPOSPHERIC LEVELS
V. L. Gaevskii, E. P. Barashkova, and L. I. Prokofeva *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 93-106 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

Aircraft measurements are reported of radiant fluxes (total and reflected radiation and upward long-wave radiation), carried out during 1968 to 1969 in Western Kazakhstan and parts of adjoining European U.S.S.R. over fixed sections with different types of underlying surface (sea, desert, steppe, forest). These measurements made it possible to estimate the absolute values of the radiant flux at different altitudes in the troposphere and their seasonal variability over different kinds of underlying surface. Author

N74-32846 Israel Program for Scientific Translations, Ltd., Jerusalem.
SPECTRAL DENSITY OF UPWARD SHORT-WAVE RADIATION FLUX OVER DIFFERENT SURFACES
N. P. Pyatovskaya *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 107-163 refs Trans. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

Calculations of the spectral density of upward short wave radiation at various atmospheric levels (from 0 to 10 km) over different surfaces are reported. The calculations were conducted for the standard radiation model of the atmosphere in the 0.4 much smaller than lambda much smaller than 2.5 micron spectral range at different solar elevations and with allowance for absorption by water vapor and carbon dioxide. For convenience in using the tables and in comparing them with experimental data, the paper also lists values of the integral flux of outgoing short wave radiation at various levels in the atmosphere, including the flux of outgoing short wave radiation for the same conditions. Author

N74-32847 Israel Program for Scientific Translations, Ltd., Jerusalem.
MEASURING THE SPECTRAL LUMINANCE OF THE SKY AT THE HORIZON IN THE KARA-KUM DESERT
V. I. Korzov and L. B. Krasilshchikov *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 164-175 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

Measurements are reported of the spectral luminance of the sky at the horizon in eight spectral sections from 0.4 to 1.1 micron and nine azimuthal directions relative to the solar vertical. Measurements were made in the Kara-Kum desert at solar elevations from 10 to 45 deg. The measuring technique and an estimate of the experimental error are also presented. Author

N74-32848 Israel Program for Scientific Translations, Ltd., Jerusalem.
AIRBORNE MEASUREMENT OF SPECTRAL REFLECTION
V. I. Korzov and L. B. Krasilshchikov *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 176-179 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972

(For availability see N74-32832 22-13)
An airborne method is examined of measuring curves of absolute spectral luminance coefficients of the underlying surface, based on measurements of relative curves of luminance and albedo.
Author

N74-32849 Israel Program for Scientific Translations, Ltd., Jerusalem.
EMISSIVITY OF CERTAIN MATERIALS IN THE 8.5-13.5 MICRON SPECTRAL REGION
I. T. Razumovskii and O. I. Popov *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 180-181 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

In order to determine the emissivity of various materials, their radiation and true temperatures were measured under field conditions at different times of the day and night. The radiation temperature was measured by a radiometer to within 0.5 C, while the true temperature was measured by the contact method to within + or - 0.5 C. We investigated 15 materials, for each of which 17 series of measurements of the radiation and true temperatures were conducted. These measurements served as a basis for calculating the effective as well as the true emissivity. These data were compared with other results and found to be in satisfactory agreement. Author

N74-32850 Israel Program for Scientific Translations, Ltd., Jerusalem.
IMPROVING THE EFFECTIVE ABSORPTION OF REFERENCE ACTINOMETERS c14
L. B. Krasilshchikov *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 182-183 Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)
CSCL 04A

A recommendation is made and a calculation is presented on improving the effective absorptivity of actinometer coatings and reducing their aging effect. Author

N74-32851 Israel Program for Scientific Translations, Ltd., Jerusalem.
A TWO-CHANNEL INFRARED RADIOMETER FOR MEASURING WATER-SURFACE TEMPERATURE AND SOME PROBLEMS ASSOCIATED WITH ITS USE c14
I. T. Razumovskii and A. A. Sivkov *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 184-190 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

A description is given of an infrared radiometer, capable of measuring water temperature from an aircraft by both channels, as well as separately. The radiant flux from the water is interrupted by a chopper, and is incident on an objective lens which directs the radiation onto the receiver. The flux from the sea is compared with ideal blackbody radiation. The radiometer employs a mirror objective, constructed according to the cardioid condenser scheme, while the receiver is a bolometer. The most precise measurements are taken when the radiometer is calibrated while airborne directly before measurements and the temperature fluctuations are small (2-3 C). In these cases the instrumental standard error does not exceed 0.3 C. When the temperature in the aircraft cabin varies markedly, the measurement error increases. Author

N74-32852 Israel Program for Scientific Translations, Ltd., Jerusalem.
A RADIOMETER DEVICE FOR MEASURING VERTICAL TEMPERATURE GRADIENTS IN THE WATER SURFACE LAYER c14
V. M. Krasavtsev and A. A. Sivkov *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 191-196 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

The block diagram and optical system are described of a radiometer device, consisting of a three channel radiometer. The first and second of these channels record radiation from the water surface in the 4,200 to 4,550 and 800 to 1,200 cm/1 spectral regions, respectively. The difference in readings of the first and second channels enables one to judge about the temperature difference in a 0.5 mm thick layer. The third radiometer channel is intended for measuring the self radiation of the atmosphere in the 4,200 to 4,550 cm/1 spectral interval. The calibration of this device is described and results presented of laboratory measurements. The sensitivity of the first and second channels was 0.05 and 0.03 C, respectively. Author

N74-32853 Israel Program for Scientific Translations, Ltd., Jerusalem.
AIRBORNE INSTRUMENTS FOR MEASURING REFLECTION: THE SPECTRAL INDICATOMETER c14
V. I. Korzov and L. B. Krasilshchikov *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 197-202 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

A description is given of a two channel instrument for measuring the relative curves of surface luminance in 10 spectral regions, separated by interference filters, in the 0.5 to 2.5 micron region. Author

N74-32854 Israel Program for Scientific Translations, Ltd., Jerusalem.
DETECTION OF SMALL INCIPIENT FIRES BY INFRARED SURVEYING
V. I. Binenko, L. N. Dyachenko, K. Ya. Kondratev, and A. P. Chernenko *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 203-212 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

The possibilities are examined of using infrared equipment to detect incipient forest fires from aircraft. The infrared detection method is more reliable and promising compared with visual observation from aircraft of the forest protection service. This method makes it possible to detect incipient fires at their earliest stages. Specific data are obtained on the optimum surveillance altitudes for detecting very small (0.5 to 1.5 sq/m) incipient fires. Author

N74-32855 Israel Program for Scientific Translations, Ltd., Jerusalem.
INFRARED MAPPING OF LARGE FOREST FIRES
V. I. Binenko, L. N. Dyachenko, K. Ya. Kondratev, and A. P. Chernenko *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 213-219 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

The possibility is shown of using scanning infrared cameras to detect all types of forest fires. The use of infrared equipment makes it possible to map large forest fires concealed by a dense blanket of smoke. Here, the location, configuration and intensity of the fire edge, as well as the speed and direction of its travel can be determined. Such information is needed by the forest protection service for developing appropriate fire control tactics. Practical results of this study are technical recommendations for developing special airborne infrared equipment for the forest fire protection service. Author

N74-32856# General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
METHODS FOR RELEASING METAL VAPORS IN THE UPPER ATMOSPHERE Final Report, Apr. 1973 - Feb. 1974
Peter D. Zavitsanos and Joseph A. Golden May 1974 36 p refs
(Contract F30602-73-C-0255; AF Proj. 1649)
(AD-780555; RADC-TR-74-138) Avail: NTIS CSCL 04/1

Based on the exothermic nature of intermetallic reactions techniques have been developed which are capable of generating high temperatures in the condensed phase. By proper selection, based on the relative vapor pressures of all the components, it is possible to selectively vaporize metals for atmospheric release applications. Two intermetallic systems were successfully tested in the laboratory for the release of atom aluminum. They are: Pd(s) + Al(s)-xes yields PdAl(1) + Al(g); Ti(s) + 2B(s) + Al(s) yields TiB2(s) + Al(g). Yields were determined for both reactions. The first reaction was used in releasing aluminum in the upper atmosphere at altitudes 145 Km and 125 Km. Observations were made on the AlO clouds which were presumably formed

by O2 attack on Al, Al + O2 yields AlO + O and subsequent photoluminescence of AlO by sunlight. Author (GRA)

N74-32857# Woods Hole Oceanographic Institution, Mass.
ELECTROMAGNETIC FLOW SENSORS
Kenneth Lawson and John Kanwisher Mar. 1974 36 p refs (Grant NSF GA-31987)
(PB-231397/1; WHOI-74-21) Avail: NTIS HC $3.25 CSCL 08C

Flow sensors based on the principle of electromagnetic induction were investigated as alternatives to commonly used mechanical devices using rotors and propellors. Prototype sensors were constructed showing considerable promise. Measurement accuracy in excess of .01 knot seems feasible with devices suited to long term battery operation. The inertial effects and many of the reliability problems inherent in moving part devices would be overcome by use of an electromagnetic sensor. Author (GRA)

N74-32858# Raytheon Co., Sudbury, Mass.
THEORETICAL STUDIES OF IONOSPHERIC HEATING BY POWERFUL RADIO WAVES, PART 3 Final Technical Report, Jan. 1973 - Feb. 1974
Gerald Meltz and Lowell H. Holway, Jr. Feb. 1974 67 p refs (Contract F30602-73-C-0154)
(AD-780553; RADC-TR-74-114-Pt-3) Avail: NTIS CSCL 04/1

In addition to the communication applications of FAS, ionospheric heating by powerful radio waves holds promise for establishing new techniques in the aeronomy of the D, E and F-regions. This report discusses the observed phenomena associated with the absorption of intense HF waves in the context of present theoretical understanding. The authors develop the fundamentals of ionospheric heating theory and apply it to the prediction of large scale electron temperature and density changes in both the D and F-layers. Generation of gravity waves by heating is also examined. (Modified author abstract) GRA

N74-32859# Raytheon Co., Sudbury, Mass.
THE ANGULAR DISTRIBUTION OF SPREAD-F RETURNS FROM AN ARTIFICIALLY MODIFIED IONOSPHERE, PART 2 Final Technical Report, Jan. 1973 - Feb. 1974
E. M. Allen, G. D. Thome, P. B. Rao, and R. L. St. Germain Feb. 1974 40 p refs
(Contract F30602-73-C-0154)
(AD-780552; RADC-TR-74-114-Pt-2) Avail: NTIS CSCL 04/1

A 32 element HF phased array has been used to study the angular spectrum of spread-F returns from an ionosphere modified by the powerful radio frequency heater transmitter at Platteville, Colorado. The diagnostic radar is a coherent pulse system which provides an angular resolution of 2.7 degrees in azimuth and elevation at the midband frequency of 7.5 MHz, a range resolution of 30 Km, and a Doppler resolution of 0.08 Hz. The results are presented in the form of sky maps (brightness versus azimuth and elevation) of the returns as a function of group delay Doppler shift, polarization, and sounding frequency. The principal result is that the returns which suffer the greatest group delay at a given sounding frequency come from a direction looking up the earth's magnetic field and exhibit negative Doppler shift. (Modified author abstract) GRA

N74-32860# Army Foreign Science and Technology Center, Charlottesville, Va.
INFLUENCE OF PARASITIC AMPLITUDE MODULATION IN GEODETIC PHASE RADAR RANGEFINDERS
A. A. Genika and M. I. Vernitskii 1 Apr. 1974 17 p refs Transl. into ENGLISH from Geod. Kartografiya (USSR), no. 7, 1972 p 15-23
(AD-781168; FSTC-HT-23-1559-73) Avail: NTIS CSCL 08/5

Parasitic amplitude modulation accompanies frequency modulation of carrier oscillations in radar rangefinders. Sources of this kind of modulation in radar rangefinders are analyzed and corrective steps are recommended. GRA

N74-32861# Naval Research Lab., Washington, D.C.
ARTIFICIAL SEA SLICKS: THEIR PRACTICAL APPLICATIONS AND ROLE IN FUNDAMENTAL RESEARCH Interim Report
William R. Barger and William D. Garrett 4 Jun. 1974 17 p refs
(NRL Proj. G02-03; NRL Proj. G02-07)
(AD-780784; NRL-7751) Avail: NTIS CSCL 08C

Artificial sea slicks are man-made, monomolecular, organic films adsorbed at the air-sea interface. They are formed from spontaneously spreading, water-insoluble polar liquids. Techniques for generating artificial sea slicks from surface vessels and from the air have been devised. Research into the chemical modification of air-sea interactions has led to several practical applications for artificial sea slicks. The ability of organic surface films to damp capillary waves renders the area covered by the film highly visible and sensible under most environmental conditions. The attenutation of both capillary and high-frequency gravity waves by artificial sea slicks has been examined under open-ocean conditions. The wave-damping property has been used as a basis for the development of seamarkers that generate highly visible, persistent ripple-damped zones on the sea surface. Large artificial slicks have been used as a tool to elucidate the mechanisms of wind-wave interactions and air-sea exchange processes. The most widely used application of film-forming organic chemicals is for the control and containment of oil spills, and increasing the efficiency of oil retrieval operations. (Modified author abstract) GRA

N74-32862# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
HIGH ALTITUDE EFFECTS SIMULATION (HAES) PROGRAM. REPORT NO. 1: ROCKET LAUNCH OF A SWIR SPECTROMETER INTO AN AURORA ICECAP 72 Environmental Research Papers
Doran J. Baker, Clair L. Wyatt, William R. Pendleton, Jr., and James C. Ulwick 5 Feb. 1974 54 p refs
(AD-780620; AFCRL-TR-74-0077; AFCRL-ERP-466) Avail: NTIS CSCL 04/1

An Astrobee D rocket (A30.205-4) was launched at Poker Flat, Alaska, on 9 March 1972 at 1052 hours UT during a condition of Class IBC2 post-breakup auroral display. A near-zenith spectral radiance profile was obtained from 48.5 km to an apogee of 91.9 km on ascent, and from 91.9 km down to about 84.7 km on descent, using a circular variable-filter spectrometer. About 268 spectral scans were obtained during flight, covering the range from 1.4 to 5.0 micrometer at a resolution of about 4 per cent. The dominant emission feature was at 4.3 micrometer, which is attributed to the CO2 nu(3) fundamental. The upward-viewed spectral radiance appeared to range from about 45 MR/micrometer at 48.5 km to less than 2 MR/micrometer at 92 km. A volume-emission-rate/altitude profile for the nu(3) fundamental of CO2 is presented. The profile is based on a simple LTE model and neglects radiation transport. As a result, the model cannot be compared directly with the data. A more complete analysis of the problem is in progress. Author (GRA)

N74-32863# Washington Univ., Seattle. Applied Physics Lab.
STUDIES IN THE MARGINAL ICE ZONE OF THE CHUKCHI SEA: ANALYSIS OF 1972 DATA
Gerald R. Garrison, Elbert A. Pence, Henry R. Feldman, and Shashikant R. Shah 14 Mar. 1974 142 p refs
(Contract N00123-71-C-1333)
(AD-779856; APL-UW-7311) Avail: NTIS CSCL 08/10

The report is a summary and analysis of studies in the Marginal Ice Zone of the Chukchi Sea in 1972 by the Applied Physics Laboratory of the University of Washington. A camp on an ice floe was established and occupied for two weeks during the summer. Temperature profiles of the water under the floe were taken simultaneously at four stations every hour to measure the character and change of the thermal microstructure in the water. At the same time, acoustic pulses were transmitted from one station to another to determine the effect of the thermal microstructure on acoustic propagation. Two 1-week cruises across the Chukchi Sea were made, one before and one after the ice floe occupancy, to study the intrusion of warm Pacific water which occurs every summer and to measure acoustic scattering from biological layers. (Modified author abstract) GRA

N74-32864# RAND Corp., Santa Monica, Calif.
A NEW TABULATION OF THE SCRIPPS TOPOGRAPHY ON A ONE-DEGREE GLOBAL GRID. PART 1: TERRAIN HEIGHTS
W. L. Gates Nov. 1973 140 p refs
(Contract DAHC15-73-C-0181; ARPA Order 189-1)
(AD-780678; R-1276-ARPA-Pt-1) Avail: NTIS CSCL 08/6

A revision and retabulation of world-wide terrain height data originally prepared at the Scripps Institution of Oceanography. Revisions to the original data include the insertion of the elevation of the surface of lakes, the negative elevation of land areas lying below sea level, and the elevation of heretofore omitted islands. A number of errors have also been corrected, and changes made in the land elevation near coasts. The newly formatted global 1-deg tabulations of terrain data are supplemented by a global analysis, frequency histograms, and zonal averages. Author (GRA)

N74-32865# Rice Univ., Houston, Tex.
IONOSPHERIC HEATING ANALYSIS Final Report
William E. Gordon and Herbert C. Carlson Apr. 1974 107 p refs
(Contract F30602-72-C-0278)
(AD-781178; RADC-TR-74-124) Avail: NTIS CSCL 04/1

Enhancements of various features of the incoherent scatter spectrum are observed when the ionosphere is illuminated with powerful, high-frequency radio waves. The radio waves excite plasma instabilities producing lines or more complex spectral features near the local plasma frequency, at the local ion-acoustic frequency, near the local gyrofrequency and twice the gyrofrequency. The enhancements occur in a thin slab as observed by the incoherent scatter radar and at both upshifted and downshifted frequencies with respect to the probing radar frequency. The enhancements are observed to vary with time when the high frequency transmitter that produces the radio wave excitation is held at constant power, and to vary with time as the high frequency transmitter is turned on or off. (Modified author abstract) GRA

N74-32866# Mainz Univ. (West Germany). Inst. fuer Meteorologie.
RESEARCH ON ATMOSPHERIC OPTICAL RADIATION TRANSMISSION Final Report, 1 Jan. 1973 - 31 Dec. 1973
K. Bullrich, K. Fischer, and G. Hanel Apr. 1974 23 p refs
(Grant AF-AFOSR-2545-7316; AF Proj. 7621)
(AD-781842; AFCRL-TR-74-0273) Avail: NTIS CSCL 04/1

Measurements of the mass absorption index of different types of atmospheric aerosol particles combined with corresponding data on the density give an insight in the absorption coefficient of the present particles. The absorption in the short wavelength range produces heating, in the infrared cooling of the air. The absorption depends upon the relative humidity and upon the climatic conditions. The results give an additional information upon the transparency of the atmosphere in different wavelength regions and suggest to be a help for climate modelling. A connection between the chemical composition and structure of aerosol particles and their water uptake at large relative humidity allows the treatment of problems concerning cloud physics as well as electromagnetic wave propagation in clouds and fog. Author (GRA)

N74-32867# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
IONOSPHERIC ELECTRON CONTENT AND RADIO SCINTILLATIONS DURING MAGNETOSPHERICALLY QUIET PERIODS IN 1970-1971 Environmental Research Papers
Gerald S. Hawkins 28 Mar. 1974 33 p refs
(AF Proj. 4643)
(AD-781750; AFCRL-ERP-472; AFCRL-TR-74-0160) Avail: NTIS CSCL 04/1

The World Data Center A of the National Academy of Sciences selected two periods in February and December 1970 when the magnetosphere was particularly quiet so that the effects of magnetic disturbances on ionospheric and geophysical phenomena could be studied by their absence. These WDC quiets were studied using AFCRL data on scintillations at 136 MHz from ATS-3 and measures of total electron content (TEC). An additional period in January 1971 was also selected when the magnetic indices were abnormally low, with the minimum daily Kp value reaching 0.0. (Modified author abstract) GRA

N74-32868# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
D-REGION IONIZATION RATES FOR THE 2-5 NOVEMBER 1969 PCA EVENT AS DETERMINED FROM SATELLITE PROTON FLUX MEASUREMENTS Environmental Research Papers
William Swider and Carol Foley (Boston Coll.) 12 Apr. 1974 29 p refs
(AF Proj. 8605)
(AD-781761; AFCRL-ERP-473; AFCRL-TR-74-0190) Avail: NTIS CSCL 04/1

D-region ionization rates have been determined from satellite proton spectra as a function of altitude for forty-four instances during the period of 2 to 5 November 1969 Polar Cap Absorption Event. The ionization rates were calculated using least square fits to the satellite proton spectra in both energy and rigidity. The combined results provide ionization rates for the event as a function of universal time. Author (GRA)

N74-32869# Stanford Research Inst., Menlo Park, Calif.
ICECAP 73: A SUMMARY REPORT
R. K. White May 1973 29 p refs
(Contract DNA001-72-C-0143)
(AD-781815; SRI-EGU-TN-1928-2; DNA-3283T) Avail: NTIS CSCL 04/1

The report summarizes the activities of the ICECAP operation at the Poler Flat Rocket Range, Alaska, in March-April 1973. The rocket launchings are described briefly, and the scientific ground support operations are indicated. The operation comprises a part of the auroral research program of the Defense Nuclear Agency. Author (GRA)

N74-32870# Utah State Univ., Logan. Electro-Dynamics Lab.
AIRCRAFT INFRARED MEASUREMENTS Final Report, 1 Oct. 1970 - 30 Nov. 1973
Ronald J. Huppi and Doran J. Baker 31 Jan. 1974 35 p
(Contract F19628-71-C-0059)
(AD-781794; AFCRL-TR-74-0108) Avail: NTIS CSCL 04/1

Infrared measurements of auroral, airglow and artificial source emissions were planned and performed. The measurements were made with a near infrared (NIR) radiometer system and a cold chopper interferometer-radiometer system operating from an AFCRL KC-135 aircraft. Some support measurements were also performed from a ground-based station. These measurements were necessary for rocket support and future aircraft-borne measurement planning and correlation. To accomplish the desired measurements, it was necessary to periodically perform calibrations, inspections, and maintenance on the instrument systems. Optional modifications were designed and constructed for the NIR system to allow measurements of target sources in bright backgrounds and to allow narrow field of view measurements. In addition, a radiometer was designed and constructed to make infrared measurements at wavelengths from 2.9 to 4.9 micrometers. Finally, a design study of a radiometer for wavelength measurements from 1.4 to 4.9 micrometers was performed. (Modified author abstract) GRA

N74-32871# Naval Weapons Lab., Dahlgren, Va.
MATHEMATICAL FORMULATION OF THE VARIATIONAL EQUATIONS FOR THE DETERMINATION OF THE EARTH'S GRAVITY FIELD
James C. Perry May 1974 28 p refs
(AD-781852; NWL-TR-3135) Avail: NTIS CSCL 22/3

Expressions for the coefficients and forcing term are derived for the variational equations to be used in a new computer program being developed to determine the earth's gravity field (Program TERRA). Also a brief idea of the role of variational equations is sketched. Author (GRA)

N74-32872# Raytheon Co., Sudbury, Mass.
A MODEL FOR FIELD ALIGNED SCATTERING (FAS) FROM HEATER MODIFIED IONOSPHERE, PART 1 Final Technical Report, Jan. 1973 - Feb. 1974
Pendyala B. Rao and George D. Thome Feb. 1974 41 p refs

(Contract F30602-73-C-0154; ARPA Order 1423)
(AD-781818; RADC-TR-74-114-Pt-1) Avail: NTIS CSCL 04/1

The paper describes the current status in the development of the on-frequency scattering model. The presentation adopts a format that is intended to orient the model toward eventual application for systems evaluation. The physical description of the scattering medium which constitutes a basic component to the model is derived from the observations currently at hand. The radar scattering properties of the disturbance are described physically by presenting the concepts of aspect sensitivity and surface of specularity for scattering by way of an optical analogy. The mathematical part contains two levels of sophistication in the model treatment. The simpler approach offers an approximate analytic solution and thereby a first-order systems evaluation capability without resorting to a complex computer code. Finally, a flow chart is given for computer adaptation of the scattering model in its general form. Author (GRA)

N74-32873# Mission Research Corp., Santa Barbara, Calif.
STUDIES OF AURORAL SIMULATION Final Report, 15 May - 31 Dec. 1973
P. W. Tarr, D. H. Archer, and N. G. Utterback 11 Apr. 1974 103 p refs
(Contracts F30602-71-C-0374; DNA001-73-C-0239)
(AD-781275; MRC-R-122; DNA-3297F) Avail: NTIS CSCL 04/1

The final report describes an effort, under the Simulation Program, to understand infrared backgrounds in an auorally-disturbed environment. A large part of this effort has been devoted to the development and use of a code, called ARCTIC, that is suitable for the study and analysis of auroral data. The code inputs a flux spectrum of primary electrons, incident on or in the atmosphere, with a specified magnetic dip angle and a given initial pitch angle distribution, and computes the detailed energy deposition and partition in the atmosphere. Scattering of the primary electrons is provided for in the deposition subroutine by two options: one, that allows for the full effects of range variance, gives excellent agreement with observations in nitrogen; the other, that is considerably more economical to use, assumes mean scattering only. (Modified author abstract) GRA

N74-32874# Control Data Corp., Minneapolis, Minn. Digital Image Systems Div.
ANALYSIS AND DEVELOPMENT OF DIGITAL MAPPING SYSTEM SOFTWARE Final Report
Leon O. Bonrud, Kenneth W. Enstrom, Dale J. Panton, and Michael O. Schroeder May 1974 123 p
(Contract DAAK02-73-C-0287)
(AD-781613; ETL-CR-74-5) Avail: NTIS CSCL 08/2

The report describes the work done in the area of digital stereo mapping under contract with the United States Army Engineer Topographic Laboratories. The philosophy and techniques developed by the Digital Image Systems Division of Control Data Corporation in the past have been applied to the design and implementation of a software system to be used in the development of algorithms that relate to the problem of digital stereo matching. The system is designed as a research tool with the basic characteristics of flexibility and simplicity incorporated into a block processing environment. The major tasks of data handling and stereo image matching are logically separate from one another and are further subdivided into versatile functional components that are easily interchangeable as new algorithms are developed. (Modified author abstract) GRA

N74-32875# Naval Electronics Lab. Center, San Diego, Calif.
CONVECTIVE ACTIVITY OBSERVED BY FM-CW RADAR Research and Development Report, Jul. 1971 - Dec. 1973
V. R. Noonkester 10 May 1974 72 p refs
(AD-781847; NELC-TR-1919) Avail: NTIS CSCL 04/2

Data taken in San Diego by the fixed and mobile FM-CW (frequency-modulated, continuous-wave) radars reveal characteristic echo structures created by forced and free convection. Echoes produced by forced convection are not structured and are observed over rough terrain when the surface wind speed is above average and the vertical lapse rate of temperature is nearly unstably stratified. Echoes produced by free convection (C-echoes) have been observed simultaneously at the coast and 5.6 km inland. C-echoes are structured and observed when the surface is strongly heated by the sun. C-echoes extended above the tops of surface-based superadiabatic layers which were always present when C-echoes were observed. The presence of the superadiabatic layer at the coast during a westerly wind is unexplained. At 5.6 km inland the C-echoes often appear like inverted Us or Vs (plumes) whose tops penetrate upward to greater heights as surface heating continues. Dissipation occurs in the late afternoon. The plumes sometimes occurred in well-defined sequences. (Modified author abstract) GRA

N74-32876# Naval Intelligence Support Center, Washington, D.C. Translation Div.
AUTOMATION OF THE COLLECTION AND ANALYSIS OF SCIENTIFIC INFORMATION AS PART OF THE PROBLEM OF THE INTERACTION BETWEEN THE ATMOSPHERE AND THE OCEAN
E. P. Borisenkov 6 Jun. 1974 44 p refs Transl. into ENGLISH from Tr. Arkt. Antarkt. Nauch.-Issled. (USSR), v. 301, 1972 p 5-42
(AD-781344; NISC-Trans-3557) Avail: NTIS CSCL 09/2

Contents: An automated system for measuring, collecting, and processing hydrometeorological data on board scientific research ships of the Main Administration of the Hydrometeorological Service (SIGMA-s), SIGMA-s software, and organization of a shore-based coordination and computer center. GRA

N74-32637 Purdue Univ., Lafayette, Ind.
A NUMERICAL SOLUTION TO A MODEL OF UNSTEADY, ADVECTIVE DIFFUSION OF MATERIAL IN THE ATMOSPHERE
Kenneth E. Dowell *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 11-32 refs (For availability see N74-32635 22-08)

N74-32638 Massachusetts Inst. of Tech., Cambridge.
THE STRUCTURE OF NEUTRAL THERMOSPHERIC WINDS AT MILLSTONE HILL, MASSACHUSETTS INFERRED FROM INCOHERENT BACKSCATTER RADAR MEASUREMENTS
Barbara Emery *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 33-55 refs (For availability see N74-32635 22-08)

N74-32639 Woods Hole Oceanographic Institution, Mass.
THE RECTIFIED RESPONSE OF A TWO LAYER MODEL OCEAN TO A TIME DEPENDENT FORCING
Dale Bruce Haidvogel *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 57-93 refs (For availability see N74-32635 22-08)

N74-33036 Israel Program for Scientific Translations, Ltd., Jerusalem.
VERTICAL DISTRIBUTION OF RADIOACTIVE AEROSOLS IN THE TROPOSPHERE OVER THE EUROPEAN USSR IN 1964 - 1967
L. E. Nazarov, L. A. Volokitina, Ya. I. Gaziev, A. F. Kuzenkov, S. G. Malakhov, and A. S. Vasilev *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 1-16 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33038 Israel Program for Scientific Translations, Ltd., Jerusalem.
DETERMINATION OF RADIOISOTOPE FALLOUT FROM ITS CONTENT IN CHRONOLOGICAL LAYERS OF HIGH ALTITUDE GLACIERS
E. N. Davydov, K. P. Makhonko, M. A. Tsevelev, and Z. S. Shulepko *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 29-36 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33041 Israel Program for Scientific Translations, Ltd., Jerusalem.
MEAN AND TURBULENT TRANSFER OF SUBSTANCES OVER THE USSR

I. G. Guterman *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 42-56 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 04A

N74-33043 Israel Program for Scientific Translations, Ltd., Jerusalem.
ACCUMULATION OF STRONTIUM-90 IN SOILS
E. B. Tyuryukanova *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 61-66 (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (For availability see N74-33035 22-20)
CSCL 18H

N74-33044 Israel Program for Scientific Translations, Ltd., Jerusalem.
CESIUM-137, STRONTIUM-90, AND LEAD-210 IN SOIL OF THE FAR NORTH REGIONS
M. N. Troitskaya, M. S. Ibatullin, B. Ya. Litver, A. N. Nizhnikov, P. V. Ramzaev, and L. A. Teplyka *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 67-71 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33045 Israel Program for Scientific Translations, Ltd., Jerusalem.
COMPARATIVE DISTRIBUTION OF STRONTIUM-90 AND CESIUM-137 IN DIFFERENT TYPES OF SOILS
E. I. Belova and Z. G. Antropova *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 72-75 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33046 Israel Program for Scientific Translations, Ltd., Jerusalem.
DISTRIBUTIONS AND MIGRATION OF STRONTIUM-90 IN SOILS
L. I. Gedeonov, S. P. Rosyanov, and V. K. Vinogradova *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 76-84 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33047 Israel Program for Scientific Translations, Ltd., Jerusalem.
HORIZONTAL WATER MIGRATION OF STRONTIUM-90
I. G. Vodovozova *In its* Nucl. Meteorol. (TT-74-5001) 1974 p 85-87 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk) Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33048 Israel Program for Scientific Translations, Ltd., Jerusalem.
FORMATION OF RADIOACTIVE PARTICLES DURING NUCLEAR BLASTS IN THE TROPOSPHERE
Yu. A. Izrael and A. A. Ter-Saakov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 88-94 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33051 Israel Program for Scientific Translations, Ltd., Jerusalem.
SIZE DISTRIBUTION OF HIGH ACTIVITY PARTICLES IN THE TROPOSPHERE IN SEPTEMBER - DECEMBER 1967
Ya. I. Gaziev, S. G. Malakhov, and L. E. Nazarov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 104-110 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33053 Israel Program for Scientific Translations, Ltd., Jerusalem.
SOME THEORETICAL NOTIONS OF RADIOACTIVITY ACQUISITION BY RAINDROPS
A. S. Avramenko and K. P. Makhonko *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 118-132 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33054 Israel Program for Scientific Translations, Ltd., Jerusalem.
DISTRIBUTION OF RAINDROPS WITH RESPECT TO SPECIFIC RADIOACTIVITY
B. I. Styro and B. K. Vebrene *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 133-136 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33055 Israel Program for Scientific Translations, Ltd., Jerusalem.
APPLICATION OF THE STOCHASTIC APPROACH TO THE PROBLEM OF THE RADIOACTIVITY OF RAINDROPS AND CLOUD-BORNE DROPS
A. S. Avramenko *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 137-145 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33056 Israel Program for Scientific Translations, Ltd., Jerusalem.
COMPARISON OF THE CHARACTERISTICS OF HYGROSCOPIC AND NONHYGROSCOPIC AEROSOL WASHOUT BY CLOUD-BORNE DROPS
I. I. Burtsev and L. V. Burtseva *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 146-153 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33057 Israel Program for Scientific Translations, Ltd., Jerusalem.
ATMOSPHERIC WASHOUT OF RADIOACTIVE CONTAMINANT IN THE MOUNTAINS OF CENTRAL CAUCASUS
A. S. Avramenko and K. P. Makhonko *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 154-165 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. No. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33082 Israel Program for Scientific Translations, Ltd., Jerusalem.
GRAPHOANALYTICAL METHOD FOR DETERMINING CESIUM-137 CONCENTRATION IN SOIL SAMPLES FROM THE GAMMA SPECTRUM
V. N. Churkin *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 319-334 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33083 Israel Program for Scientific Translations, Ltd., Jerusalem.
RADIOCHEMICAL METHOD OF DETERMINING LOW STRONTIUM-90 CONCENTRATION LEVELS IN ENVIRONMENTAL SAMPLES
V. B. Chumichev *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 335-339 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33087 Israel Program for Scientific Translations, Ltd., Jerusalem.
VERTICAL DISTRIBUTION OF THE CONCENTRATION OF RADON DECAY PRODUCTS IN THE 0-300-m LAYER
L. V. Kirichenko and S. G. Malakhov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 358-360 ref Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33348 Oxford Univ. (England). Dept. of Physics.
INTRODUCTION TO THE ATMOSPHERE
J. T. Houghton *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 8 p (For availability see N74-33347 22-31)

N74-33349 Ludwig-Maximilians-Universitat, Munich (West Germany). Inst. fuer Meteorologie.
SPECTRAL SIGNATURES OF MINOR ATMOSPHERIC CONSTITUENTS AND EXPERIMENTAL POSSIBILITIES TO USE THEM FOR POLLUTION MONITORING
H. J. Bolle *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 100 p refs (For availability see N74-33347 22-31)

N74-33350 Science Research Council, Slough (England).
THE NEUTRAL AND ION CHEMISTRY OF THE MESOSPHERE AND THERMOSPHERE
Lance Thomas *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 25 p refs (For availability see N74-33347 22-31)

N74-33351 Oxford Univ. (England). Dept. of Physics.
REMOTE SOUNDING. INTRODUCTION
J. T. Houghton *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 15 p refs (For availability see N74-33347 22-31)

N74-33353 Science Research Council, Slough (England).
LASER SOUNDING EXPERIMENTS
L. Thomas *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 25 p refs (For availability see N74-33347 22-31)

N74-33354 European Space Research Organization, Paris (France).
REPORT ON DISCUSSIONS ON SPACELAB PAYLOADS FOR ATMOSPHERIC RESEARCH
In its The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 17 p (For availability see N74-33347 22-31)

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N74-32877* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MEASURING PROBE POSITION RECORDER Patent
Bruce Flagge, inventor (to NASA) Issued 3 Sep. 1974 3 p Filed 12 Jan. 1973 Supersedes N73-15474 (11 - 06, p 0673)
(NASA-Case-LAR-10806-1; US-Patent-3,832,781;
US-Patent-Appl-SN-322998; US-Patent-Class-33-23R;
US-Patent-Class-33-1M; US-Patent-Class-338-89;
US-Patent-Class-340-347AD; US-Patent-Class-346-33R) Avail: US Patent Office CSCL 14B

A device which enables a person to record the location of measurements made by a hand held nonconducting probe is described. The hand probe is coupled to a linear potentiometer and a sine-cosine potentiometer by means that varies the output of the linear potentiometer proportional to the distance between the hand probe and the linear potentiometer and that varies the output of the sine-cosine potentiometer proportional to the angular movement of the hand probe relative to the sine-cosine potentiometer. The output of the linear potentiometer is applied directly to one input of the sine-cosine potentiometer and is applied through an inverter to the other input or the sine-cosine potentiometer. The cosine and sine outputs of the sine-cosine potentiometer are applied to the X and Y outputs, respectively, of an X-Y recorder. Official Gazette of the U.S. Patent Office

N74-32878* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STAGNATION PRESSURE PROBE Patent
Michael J. Goodyer, inventor (to NASA) (NAS-NRC) Issued 3 Sep. 1974 6 p Filed 7 Sep. 1972 Supersedes N73-20483 (11 - 11, p 1292) Sponsored by NASA
(NASA-Case-LAR-11139-1; US-Patent-3,832,903;
US-Patent-Appl-SN-287149; US-Patent-Class-73-388;
US-Patent-Class-73-182) Avail: US Patent Office CSCL 14B

A method and apparatus for measuring the stagnation pressure of supersonic velocity gas streams without the generation of shock waves which interfere with such measurements are given. The technique is insensitive to the type of gas and Mach number and is therefore particularly useful in the study of jet engine exhausts. Official Gazette of the U.S. Patent Office

N74-32879* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METHOD AND DEVICE FOR DETECTION OF SURFACE DISCONTINUITIES OR DEFECTS Patent
Lubert J. Leger, inventor (to NASA) Issued 20 Aug. 1974 22 p Filed 24 Jan. 1973 Supersedes N73-17564 (11 - 08, p 0923)
(NASA-Case-MSC-14187-1; US-Patent-3,830,094;
US-Patent-Appl-SN-326326; US-Patent-Class-73-15.4;
US-Patent-Class-73-40.7; US-Patent-Class-73-104;
US-Patent-Class-23-230L) Avail: US Patent Office CSCL 14B

Surface discontinuities of defects such as cracks and orifices are detected by applying a penetrating fluid, preferably a liquid, to a test surface so as to cause the liquid to penetrate any minute cracks or opening in the surface, removing the excess liquid from the surface, and leaving a residual in the discontinuities, cavities, or in the subsurface materials. A sheet of porous material impregnated with a sensitizing medium which will react with vapors of the residual liquid to form a visible pattern is applied to the test surface. The residual liquid trapped in the discontinuities, cavities, or subsurface material is vaporized, and, as the vapors contact the sensitizing medium on the sheet, a pattern corresponding to the discontinuity is formed on the sheet material and the penetrant completely removed from the sample.
Official Gazette of the U.S. Patent Office

N74-32880 Ernst-Mach-Inst., Freiburg (West Germany).
INCREASING THE ACCURACY OF ANALOG MEASURING OPERATIONS BY MEANS OF DIGITAL SYSTEMS
S. Stots and M. Detterer 1973 17 p refs In GERMAN; ENGLISH summary
(Rept-8/73) Avail: Issuing Activity

A method to improve the accuracy of analog short-time measurements is described. Two known and precisely defined values are applied successively to the input of the measuring equipment. The resulting output voltages are digitized and stored separately. The digital numbers form defined reference values for the automatic calibration of the entire measuring system from the pick-up to the output of the measuring signal. ESRO

N74-32881*# National Center for Atmospheric Research, Boulder, Colo. High Altitude Observatory.
ASTRONAUT OPERATIONS REQUIREMENTS DOCUMENT FOR THE WHITE LIGHT CORONAGRAPH EXPERIMENT S-052 FOR THE APOLLO TELESCOPE MOUNT
C. L. Ross Jan. 1973 46 p refs
(Contract NAS5-3950)
(NCAR-TN/IA-66) Avail: NTIS HC $5.50 CSCL 14B

Information necessary for successful performance of the observer's function in the White Light Coronagraph portion of the Apollo Telescope Mount experiments is presented. The pre-flight, in-flight, and post-flight operations required to perform the S-052 experiment are described. A discussion of the scientific objectives of the experiment and a description of the hardware are provided. Author

N74-32882*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CLOCK SETTER Patent Application
Claude T. Haley, inventor (to NASA) Filed 9 Sep. 1974 7 p
(NASA-Case-LAR-11458-1; US-Patent-Appl-SN-504225) Avail: NTIS HC $4.00 CSCL 14B

An apparatus for manually adjusting large wall-mounted clocks, while the operator stands on the floor, is discussed. The device consists of a long handled tool which slips over the reset knob of the clock allowing a downward and twisting motion to adjust the indicated time. A diagram of the device is provided. NASA

N74-32883*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
COSMIC DUST ANALYZER Patent Application
Neal L. Roy, inventor (to NASA) (TRW Systems Group) Filed 31 May 1974 41 p
(Contract NAS9-9309)
(NASA-Case-MSC-13802-2; US-Patent-Appl-SN-475338) Avail: NTIS HC $5.25 CSCL 14B

Methods and apparatus are provided which employ ion time-of-flight techniques to determine the constituency of a high velocity particle of matter such as a micrometeorite. A charged target electrode is arranged to intercept the particle, the impact of which will create a discrete cloud or plasma of ions of both the target material as well as the particle matter. A charged collector electrode is spaced a preselected distance from the target electrode to receive the ions. However, the region between the two electrodes is established as a low density field-free region, and if the ions are then accelerated into the collector electrode at a proper body, the ions in the plasma will tend to travel at a velocity which is substantially a function of only the mass of the ion. Accordingly, the ions in the plasma will tend to separate into groups according to mass, and since each group of ions can be counted as well as identified as to mass, the ions of target material can be separated from the measurement. NASA

N74-32884*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PHOTOGRAPHIC FILM RESTORATION SYSTEM Patent Application
Joseph L. Horner, inventor (to NASA) Filed 8 Feb. 1974 14 p
(NASA-Case-MSC-12448-2; US-Patent-Appl-SN-440918) Avail: NTIS HC $4.00 CSCL 14E

A color photographic film restoration system is described. The system is comprised of a source of coherent light illuminating an exposed film with a degraded image, a Fourier transform lens behind the exposed film, a spatial filter behind the transform lens, another Fourier transform lens behind the spatial filter, and an unexposed color film for recording a corrected representation of the degraded color image on the unexposed film. A total optical system is disclosed in which the spatial filter may comprise a photographic film whose transmittance characteristics restores the ratio of the zero to the higher spatial frequency components of image produced by the system. An opto-electronic system is also disclosed in which the spatial filter is a part of a digital computer. NASA

N74-32885*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACEFLIGHT METEOROID COMPOSITION EXPERIMENT Patent Application
Herbert A. Zook and Richard W. High, inventors (to NASA) Filed 5 Mar. 1974 11 p
(NASA-Case-MSC-12423-1; US-Patent-Appl-SN-448320) Avail: NTIS HC $4.00 CSCL 14B

A device for capturing, in space, meteoroid particles which are uncontaminated by the capture environment is described. The capture cell is a cube or other shaped cell of very pure material. The cell has one open side over which is fixed a thin membrane. An array of these cells is exposed to the space environment where it is eventually struck by a meteoroid. The particles of the meteoroid penetrate the membrane and are imbedded in the walls of the cell. NASA

N74-32886*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMPACT POSITION DETECTOR FOR OUTER SPACE PARTICLES Patent Application
Siegfried O. Auer, inventor (to NASA) (NAS-NRC) Filed 30 Aug. 1974 31 p
(Contract NSR-09-01-087)
(NASA-Case-GSC-11829-1; US-Patent-Appl-SN-502136) Avail: NTIS HC $4.75 CSCL 14B

The impact position of cosmic dust, micrometeoroids, and other similar outer space particles was detected with an array including a multiplicity of mutually insulated, metal electrode strips, a first group of which has parallel, longitudinal axes at right angles to a second group of the strips. A delay line which has a multiplicity of taps, each of which is connected to one of the strips is provided. The delay times between adjacent tapes of the delay line are approximately the same. One end of the delay line is terminated with a resistor having a value substantially equal to the characteristic impedance of the delay line. The arrival time at a delay line output terminal of pulses induced in the delay line in response to particle impact is determined relative to the occurrence time of a further pulse derived in response to the impact. Circuitry is provided to separate pulses induced in the line from different strips, even though there are substantially simultaneous impacts on the different strips. NASA

N74-32887*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MOVING PARTICLE COMPOSITION ANALYZER Patent Application
Siegfried O. Auer, inventor (to NASA) (NAS-NRC) Filed 30 Aug. 1974 19 p
(Contract NSR-09-01-087)
(NASA-Case-GSC-11889-1; US-Patent-Appl-SN-502124) Avail: NTIS HC $4.00 CSCL 14B

Mass spectrometry apparatus for analyzing the composition of moving microscopic particles is presented. The apparatus includes a capacitor with a front electrode upon which the particles impinge, a back electrode, and a solid dielectric sandwiched between the front and back electrodes. The electrodes and dielectric are arcuately shaped as concentric peripheral segments of different spheres having a common center and different radii. The front electrode and dielectric together have a thickness such that an impinging particle can penetrate them. The front electrode is negatively biased relative to the back electrode so that an impinging particle causes the front and back electrodes to become electrically connected to form a discharge spark between the electrodes. The discharge spark causes ejection from the front electrode of positive ions of elements in the impinging particle. Arrival times of different ions are measured to complete the analysis. NASA

N74-32888*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MICROMETEOROID VELOCITY AND TRAJECTORY ANALYZER Patent Application
Siegfried O. Auer, inventor (to NASA) (NAS-NRC) Filed 30 Aug. 1974 24 p
(Contract NSR-09-01-087)
(NASA-Case-GSC-11892-1; US-Patent-Appl-SN-502135) Avail: NTIS HC $4.25 CSCL 14B

Movement of a charged particle through a region is detected by providing a detector including first, second and third spaced metal grids pervious to the particle and positioned so that the particles passes through them in sequence. The first and third grids are short-circuited to each other and to ground. A signal input terminal of a dc amplifier is connected in dc circuit with the second grid so that a voltage pulse induced in the second grid by the particle passing through the three results in an output pulse of the amplifier. A plurality of such detectors are arranged

for enabling the position and velocity vectors of the charged particle to be detected in three mutually orthogonal axes, X, Y and Z. NASA

N74-32889*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A MAGNETIC FIELD MEASUREMENT TECHNIQUE USING A MINIATURE TRANSDUCER An Early Domestic Dissemination Report
Carl L. Fales, Jr., Roger A. Breckenridge, and William J. Debnam, Jr. Washington Sep. 1974 26 p refs
(Proj. FEDD)
(NASA-TN-D-7746; L-9701) Avail: NASA Regional Dissemination Centers only to U.S. Requesters: HC $3.00/MF $1.45 CSCL 14B

The development, fabrication, and application of a magnetometer are described. The magnetometer has a miniature transducer and is capable of automatic scanning. The magnetometer described here is capable of detecting static magnetic fields as low as 1.6 A/m and its transducer has an active area 0.64 mm by 0.76 mm. Thin and rugged, the transducer uses wire, 0.05 mm in diameter, which is plated with a magnetic film, enabling measurement of transverse magnetic fields as close as 0.08 mm from a surface. The magnetometer, which is simple to operate and has a fast response, uses an inexpensive clip-on milliammeter (commonly found in most laboratories) for driving and processing the electrical signals and readout. A specially designed transducer holding mechanism replaces the XY recorder ink pen; this mechanism provides the basis for an automatic scanning technique. The instrument has been applied to the measurements of magnetic fields arising from remanent magnetization in experimental plated-wire memory planes and regions of magnetic activity in geological rock specimens. Author

N74-32890*# National Aeronautics and Space Administration. Pasadena Office, Calif.
ION AND ELECTRON DETECTOR FOR USE IN AN ICR SPECTROMETER Patent Application
Wesley T. Huntress, inventor (to NASA) (JPL) Filed 27 Aug. 1974 19 p
(Contract NAS7-100)
(NASA-Case-NPO-13479-1; US-Patent-Appl-SN-500981) Avail: NTIS HC $4.00 CSCL 14B

A detector for detecting ions and/or electrons present in a resonance cell of an ion cyclotron resonance spectrometer is discussed. The detector, which operates on the Q-meter principle, is driven by an external radio frequency oscillator capable of providing radio frequencies up to about 15 MHz at an adjustable low radio frequency signal level. The detector is connected across the resonance of the cell to detect ions by their cyclotron frequency. Electrons are detectable by connecting the detector across the cell's trapping plates which detects the motion of the electrons, the frequency of which is in the megahertz range. NASA

N74-32891# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
DESIGN AND CALIBRATION OF FOUR PROBES FOR USE IN THE TRANSONIC TURBINE CASCADE TESTING
C. Sieverding, L. Maretto, F. Lehthaus (DFVLR, Goettingen), and O. Lawaczeck (DFVLR, Goettingen) May 1974 57 p ref
(TN-100) Avail: NTIS HC $6.00

The design and tests of four probes for investigating the flow behind straight transonic turbine cascades are described. The calibration tests were carried out at the DFVLR - AVA - Goettingen, and at the von Karman Institute. The probes were investigated in the Mach number range 0.8 less than or equal to 2.2 for the range of incidence angles -12 deg less than or equal to alpha less than or equal to +12 deg. Special attention is given to the calibration in the transonic domain. The influence of Reynolds numbers on the probe calibrations was studied at M = 1.64 and 2.2. Author

N74-32892*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
SIGNATURE EXTENSION STUDIES Technical Report, 1 Feb. 1973 - 31 Jan. 1974
R. K. Vincent, G. S. Thomas, and R. F. Nalepka Jul. 1974 51 p
(Contract NAS9-9784)
(NASA-CR-140200; ERIM-190100-26-T) Avail: NTIS HC $5.75 CSCL 14E

The importance of specific spectral regions to signature extension is explored. In the recent past, the signature extension task was focused on the development of new techniques. Tested techniques are now used to investigate this spectral aspect of the large area survey. Sets of channels were sought which, for a given technique, were the least affected by several sources of variation over four data sets and yet provided good object class separation on each individual data set. Using sets of channels determined as part of this study, signature extension was accomplished between data sets collected over a six-day period and over a range of about 400 kilometers. Author

N74-32893*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
ANALYSIS OF MULTISPECTRAL SIGNATURES AND INVESTIGATION OF MULTI-ASPECT REMOTE SENSING TECHNIQUES Technical Report, 1 Feb. - 31 Oct. 1973
W. A. Malila, R. H. Hieber, and J. E. Sarno Jul. 1974 114 p refs
(Contract NAS9-9784)
(NASA-CR-140201; ERIM-190100-27-T) Avail: NTIS HC $8.75 CSCL 14E

Two major aspects of remote sensing with multispectral scanners (MSS) are investigated. The first, multispectral signature analysis, includes the effects on classification performance of systematic variations found in the average signals received from various ground covers as well as the prediction of these variations with theoretical models of physical processes. The foremost effects studied are those associated with the time of day airborne MSS data are collected. Six data collection runs made over the same flight line in a period of five hours are analyzed, it is found that the time span significantly affects classification performance. Variations associated with scan angle also are studied. The second major topic of discussion is multi-aspect remote sensing, a new concept in remote sensing with scanners. Here, data are collected on multiple passes by a scanner that can be tilted to scan forward of the aircraft at different angles on different passes. The use of such spatially registered data to achieve improved classification of agricultural scenes is investigated and found promising. Also considered are the possibilities of extracting from multi-aspect data, information on the condition of corn canopies and the stand characteristics of forests. Author

N74-32894*# Bendix Corp., Teterboro, N.J. Guidance Systems Div.
APOLLO TELESCOPE MOUNT (ATM) GIMBALLED STAR TRACKER Final Report
John Della Lana 1974 177 p Revised Original contains color illustrations
(Contract NAS8-30105)
(NASA-CR-120439) Avail: NTIS HC $12.00 CSCL 22B

Design and development of six gimballed star trackers for Skylab's Apollo Telescope Mount, which performed successfully on all three manned Skylab missions and accumulated a total usage time of approximately 3,500 hours, is described in terms of configurations, materials and construction, qualification testing, performance, and reliability characteristics. A brief program history and design changes incorporated during the life of the program are also discussed. Extensive drawings, block diagrams, and photographs are provided. A.A.D.

N74-32895*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFRARED HETERODYNE SPECTROSCOPY OF ASTRONOMICAL AND LABORATORY SOURCES AT 8.5 MICRON
M. Mumma, T. Kostiuk, S. Cohen, D. Buhl (Natl. Radio Astron. Obs., Greenbank, West Va.), and P. C. VonThuna (Arthur D. Little, Inc., Chambridge, Mass.) Aug. 1974 20 p refs Submitted for publication
(NASA-TM-X-70744; X-691-74-237) Avail: NTIS HC $4.00 CSCL 14B

The first infrared heterodyne spectrometer using tuneable semiconductor (PbSe) diode lasers has been constructed and was used near 8.5 micron to measure absorption line profiles

of N2O in the laboratory and black body emission from the Moon and from Mars. Spectral information was recorded over a 200 MHz bandwidth using an 8-channel filter bank. The resolution was 25 MHz and the minimum detectable (black body) power was 1 x 10 to the minus 16th power watts for 8 minutes of integration. The results demonstrate the usefulness of heterodyne spectroscopy for the study of remote and local sources in the infrared. Author

N74-32896*# Faraday Labs., Inc., La Jolla, Calif.
IMPROVED THERMOELECTRICALLY COOLED QUARTZ CRYSTAL MICROBALANCE Final Report, 27 Aug. 1973 - 26 Aug. 1974
W. E. McKeown, W. E. Corbin, Jr., and M. G. Fox 26 Aug. 1974 47 p refs
(Contract NAS8-27879)
(NASA-CR-120419; FAR-74-013) Avail: NTIS HC $5.50 CSCL 14B

Design changes in the thermoelectrically-cooled quartz microbalance, which is used to monitor surface contamination in space simulation chambers, is described in terms of its extended temperature range, increased temperature control, mass sensitivity, and cooling power. The mass sensor uses 20 MHz quartz crystals having a sensitivity of 8.8 x 10 to the minus tenth power g/sq cm - Hz. The crystals are optically polished, metal plated, and overplated with magnesium fluoride to simulate an optical surface. The microbalance temperature circuitry is designed to readout and control surface temperature between 100 C and minus 59 C to plus or minus 0.5 C, and readout only temperature between minus 60 C and minus 199 C using auxiliary liquid nitrogen cooling. Data is included on the measurement of oil contamination of surfaces as a function of temperature in space simulation chambers. Author

N74-32897*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
DATA PROCESSING IMPROVEMENTS FOR THE SKYLAB S-191 EREP SPECTROMETER
Charles E. Campbell Jun. 1974 32 p
(Contract NAS9-12200)
(NASA-CR-140208; LEC-3580) Avail: NTIS HC $4.75 CSCL 20F

The characteristics of the S-191 spectrometer (filter wheel infrared spectrometer) are discussed. Inherent deficiencies in previous spectrometers are described and the techniques for correcting the deficiencies are explained. The radiance errors caused by error in wavelength are identified and the effects on the accuracy of the spectrometer are described. It is stated that the most important source of error in the S-191 spectrometer is off-band radiation in which the detected radiation is far from the wavelength which is expected to be detected by the sensor at that particular time. A numerical analysis of the effects of off-band radiation is developed. Author

N74-32898*# Battelle Columbus Labs., Ohio.
DEVELOPMENT OF STRAIN GAGES FOR USE TO 1311 K (1900 F) Final Report
M. M. Lemcoe 10 Jul. 1974 98 p refs
(Contract NAS1-12099)
(NASA-CR-132485) Avail: NTIS HC $4.00 CSCL 14B

A high temperature electric resistance strain gage system was developed and evaluated to 1366 K (2000 F) for periods of at least one hour. Wire fabricated from a special high temperature strain gage alloy (BCL-3), was used to fabricate the gages. Various joining techniques (NASA butt welding, pulse arc, plasma needle arc, and dc parallel gap welding) were investigated for joining gage filaments to each other, gage filaments to lead-tab ribbons, and lead-tab ribbons to lead wires. The effectiveness of a clad-wire concept as a means of minimizing apparent strain of BCL-3 strain gages was investigated by sputtering platinum coatings of varying thicknesses on wire samples and establishing the optimum coating thickness--in terms of minimum resistivity changes with temperature. Finally, the moisture-proofing effectiveness of barrier coatings subjected to elevated temperatures was studied, and one commercial barrier coating (BLH Barrier H Waterproofing) was evaluated. Author

N74-32899# Federal Aviation Administration, Washington, D.C. Systems Research and Development Service.
BAROMETRY AND ALTIMETER SETTING INDICATION
Wolcott M. Smith Dec. 1973 33 p
(AD-773446; FAA-RD-73-204) Avail: NTIS HC $3.25

Some of the basic considerations for barometry, with particular reference to altimeter setting indicators (ASI) are reviewed. The development of ASI from barometric values of pressure is explained. A newly derived table of station height in feet versus barometric pressure in inches of mercury (Hg) is provided and its use explained. A brief discussion of digital readout ASI systems are included. Author

N74-32900*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB APOLLO TELESCOPE MOUNT THERMAL CONTROL SYSTEM MISSION EVALUATION
Uwe Hueter Sep. 1974 63 p refs
(NASA-TM-X-64823) Avail: NTIS HC $3.75 CSCL 14B

The Skylab Saturn Workshop Assembly was designed to expand the knowledge of manned earth orbital operations and accomplish a multitude of scientific experiments. The Apollo Telescope Mount (ATM), a module of the Skylab Saturn Workshop Assembly, was the first manned solar observatory to successfully observe, monitor, and record the structure and behavior of the sun outside the earth's atmosphere. The ATM contained eight solar telescopes that recorded solar phenomena in X-ray, ultraviolet, white light, and hydrogen alpha regions of the electromagnetic spectrum. In addition, the ATM contained the Saturn Workshop Assembly's pointing and attitude control system, a data and communication system, and a solar array/rechargeable battery power system. This document presents the overall ATM thermal design philosophy, premission and mission support activity, and the mission thermal evaluation. Emphasis is placed on premission planning and orbital performance with particular attention on problems encountered during the mission. ATM thermal performance was satisfactory throughout the mission. Although several anomalies occurred, no failure was directly attributable to a deficiency in the thermal design. Author

N74-32901*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A DATA REDUCTION TECHNIQUE AND ASSOCIATED COMPUTER PROGRAM FOR OBTAINING VEHICLE ATTITUDES WITH A SINGLE ONBOARD CAMERA
Richard J. Bendura and Philip G. Renfroe (LTV Aerospace Corp., Hampton, Va.) Washington Sep. 1974 65 p refs
(NASA-TM-X-3050; L-9641) Avail: NTIS HC $3.75 CSCL 14E

A detailed discussion of the application of a previously method to determine vehicle flight attitude using a single camera onboard the vehicle is presented with emphasis on the digital computer program format and data reduction techniques. Application requirements include film and earth-related coordinates of at least two landmarks (or features), location of the flight vehicle with respect to the earth, and camera characteristics. Included in this report are a detailed discussion of the program input and output format, a computer program listing, a discussion of modifications made to the initial method, a step-by-step basic data reduction procedure, and several example applications. The computer program is written in FORTRAN 4 language for the Control Data 6000 series digital computer. Author

N74-32902# Power Reactor and Nuclear Fuel Development Corp., Tokai (Japan).
DEVELOPMENT OF A HIGH TEMPERATURE STRAIN GAGE, 2
H. Yuuki, K. Kania, and Y. Yamura Dec. 1973 57 p refs
(JAPFNR-141; PNC-N-251-73-3) Avail: AEC Depository Libraries HC $5.00

The development and performance of a Pt-W-wire resistance type strain gage for strength measurement of various construction materials used in fast breeder reactor plants are described. NSA

N74-32903# Los Alamos Scientific Lab., N.Mex.
DEVELOPMENT OF A LASL WHOLE-AIR SAMPLER FOR WB-57F AIRCRAFT

R. D. Glenn Jan. 1974 8 p refs
(Contract W-7405-eng-36)
(LA-5491-MS) Avail: NTIS HC $4.00

A whole-air sampler was developed for collecting samples of stratospheric air at ambient pressures for laboratory analysis. The principle of operation is to evacuate the sample containers, fly them to sampling altitude, open the remotely operated vacuum valves, and take in ambient air through a suitable air delivery system until the internal sample pressure equilibrates with ambient. This system was designed for use aboard the WB-57F aircraft. The first test series was flown and certain mechanical problems uncovered. Conclusions and recommendations for system improvement and future investigations are presented.
Author (NSA)

N74-32904# European Space Research Organization, Paris (France).
SOME INVESTIGATIONS OF THE LIMITS OF THE WORKING RANGE OF METALLIC SPRING MATERIALS FOR WIND-TUNNEL BALANCES WITH STRAIN GAUGE SYSTEMS
Paul-Juergen Weber Jun. 1974 61 p refs Transl. into ENGLISH of Einige Untersuch. ueber die Grenzen der Arbeitsbereiche Metallischer Federwerkstoffe fuer Windkanalwaagen mit Dehnungsmessstreifensystemen, DLR-FB-73-81, DFVLR, 19 Jun. 1973 (ESRO-TT-67; DLR-FB-73-81) Avail: NTIS HC $6.25; DFVLR, Porz, West Ger. 20,30 DM

Stemming from the trend to extend the range of application of wind tunnel balances with strain gauge systems, the working range of appropriate spring metals were tested in order to fix a lower and an upper elongation limit as a material specific value. Results are described by working diagrams, and their consequences for the construction of balances are considered.
Author (ESRO)

N74-32905# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France).
EVALUATION OF THE KEARFOTT GYROSCOPE TYPE GYROFLEX MODEL 2 NO. 4640 [EVALUATION DU GYROSCOPE KEARFOTT TYPE GYROFLEX MOD 2 NO. 4640]
20 Nov. 1973 72 p refs In FRENCH
(Contract DTEN-71.179)
(LRBA-E-209-PV-4/sie) Avail: NTIS HC $6.75

Performance tests on the Kearfott Mod. 2 gyroflex gyroscope are presented. Special emphasis was put on day to day repeatability and stabilization time. The mathematical model drift parametric values (torque, imbalance, anelasticity, and bearings) are derived together with in-phase and quadrature stiffness. Temperature effects were estimated and the properties of the electronic device for angular detection are discussed. ESRO

N74-32906# National Aerospace Lab., Amsterdam (Netherlands).
APPLICATION OF MICROWAVE TECHNIQUES TO THE MEASUREMENT OF THE POSITION OF A FAST MOVING PISTON IN A BARREL
O. B. M. Pietersen and F. Klinker 1974 34 p refs Presented at the European Conf. on Electrotechniques "Eurocon 1974", Amsterdam, 22-26 Apr. 1974
(NLR-TR-72145-U) Avail: NTIS HC $4.75

A system for measuring the position of a very fast moving dual piston in a steel barrel using microwave techniques is described. Due to the piston movement, the barrel behaves as a cavity resonator of variable dimension. Because a cavity absorbs power under resonance conditions, it is possible to determine the displacement of the piston from the measurement of reflected power when the cavity is excited. Attention is given to the influence of the excitation probe on the performance of the resonator, the determination of the direction of movement, and the recording system. The use of microwaves with a wavelength of 0.12 m at 3500 MHz enabled the measurement of the position of a piston which moved at a speed of up to 700 m/s in a barrel of 8 m length. Author (ESRO)

N74-32907# Madrid Univ. (Spain). Dept. of Physics.
IMAGE STORAGE TUBE. COMPONENTS ASSESSMENT. F-CENTER COLORED ALKALI HALIDE FILMS AS POTENTIAL IMAGE STORAGE TARGETS Final Report
A. Soler, L. Galan, F. Rueda, J. Summers, and F. Agullo-Lopez
1 May 1973 68 p refs
(Contract ESTEC-1387/71-AA)
(ESRO-CR(P)-213) Avail: NTIS HC $6.50

Alkali halide films containing F-centers were considered as potential storage elements for image storage tubes. Information on irradiation and photoemission behavior was analyzed, and a few materials were selected for experimental testing. Moreover the use of U-doped crystals as efficient storage targets for the soft X-ray and UV spectral ranges was foreseen. The selected materials were checked for their performance as adequate targets. Special attention was given to the irradiation and photoemission behavior of cesium halides, particularly CsCl. Detailed measurement of the overall efficiencies, dependance on primary energy, optimum sample thickness, etc., was performed. Other characteristics, such as thermal and optical stability, were also considered. In addition to F-colored alkali halides, the behavior of U-doped materials was investigated. ESRO

N74-32908# European Space Research Organization, Paris (France).
USE OF NUMERICAL TECHNIQUES FOR THE GENERATION AND RECONSTRUCTION OF HOLOGRAMS
Alain Bourgine Jun. 1974 31 p refs Transl. into ENGLISH of L'Utilisation des Tech. Numeriques pour la Fabric. et la Restitution d'Hologrammes, ONERA-NT-214, ONERA, Jul. 1973 (ESRO-TT-64; ONERA-NT-214) Avail: NTIS HC $4.75

With a bibliographic study as a basis, the main trends of research in the field of numerical holography were examined. The introduction of the computer as an active element for image formation allowed the pure numerical synthesis of holograms to be realized. The corresponding generation and recording techniques are reviewed, and some important applications are given. Wave pattern reconstruction, also realized on computer, allows images of excellent quality to be obtained, and seems of particular interest in acoustic holography. The advantages and limitations of numerical techniques were studied in comparison with purely optical processes of image reconstruction. Author (ESRO)

N74-32909# Boeing Aerospace Co., Seattle, Wash.
DEVELOPMENT OF CRITERIA FOR PRINTING COLOR RECONNAISSANCE STEREO STRIP PHOTOGRAPHY FOR INTERPRETATION UNDER DYNAMIC VIEWING CONDITIONS Final Report
Conrad L. Kraft and Charles D. Anderson Dec. 1973 89 p refs
(Contract F33615-73-C-4034; AF Proj. 7183)
(AD-781123; AMRL-TR-73-104) Avail: NTIS CSCL 14/5

The purpose of the report is to determine, in searching for man-made targets in strip reconnaissance color photography, how the variables of camera lens convergence angle and film contrast contribute to performance and to develop a quantitative chromostereopsis test and determine the distribution of this phenomenon among observers. Sixty-three individuals were screened for their visual acuity, stereopsis, phorias at infinity and, 14 inches (color vision only at 14 inches). After brief training their target acquisition performance was measured using a Sonne SC-2 near-real-time display of 1:2580 scale reconnaissance chromatic imagery. The effects of convergence angles of 0, 10 and 20 degrees and of high, medium and low film contrasts were investigated. In preparing the stimuli a new target acquisition test was developed using Kodak SO-242 high resolution color film. The flights were made by the USAF over Ft. Riley, Kansas. GRA

N74-32910# Illinois Univ., Urbana. Dept. of Civil Engineering.
PHOTOGRAMMETRIC POTENTIALS OF NONMETRIC CAMERAS
Y. I. Abdell-Aziz and H. M. Karara Mar. 1974 134 p refs
(Grant NSF GK-11655)
(PB-231254/4; UILU-CE-36; UILU-ENG-74-2002) Avail: NTIS HC $9.75 CSCL 08B

An analytical data reduction approach particularly suitable for nonmetric photography has been developed and tested using fictitious as well as real data. The accuracy of photogrammetric system has been investigated and an expression for estimation of the accuracy of the total system has been developed.

Experimental investigations using a number of metric and nonmetric cameras indicated that photogrammetric systems incorporating nonmetric cameras are capable of achieving accuracy levels acceptable in numerous areas of application of close-range photogrammetry. Accordingly, it is recommended that nonmetric cameras be seriously considered for data acquisition in those areas of close-range photogrammetry, where the accuracy requirements permit. Author (GRA)

N74-32911# Army Missile Command, Redstone Arsenal, Ala.
THE EFFECT OF APPLIED MAGNETIC FIELDS ON THE PAUSE TIME PHENOMENON OF EXPLODING WIRES
D. Holder Apr. 1974 33 p refs
(AD-780012; RG-74-22) Avail: NTIS CSCL 19/1

The report covers experimental work performed on the processes of a wire undergoing electrical explosion. The object was to explore the effects of an externally-impressed magnetic field. The external field was applied in two different manners: transversely (arc blow-out fashion) and axially (magnetic pinch fashion). The particular process of interest is that phenomenon termed dark pause. The span of this pause is measured and compared for the same size wire sample for each field orientation. Author (GRA)

N74-32912# Cornell Univ., Ithaca, N.Y. Center for Radiophysics and Space Research.
INFRARED SPECTROMETER SYSTEM FOR AEROBEE ROCKET PAYLOAD
James R. Houck, Daniel A. Briotta, Jr., and Judith L. Pipher 15 Mar. 1974 10 p
(Contract F19628-73-C-0242; AF Proj. 1366)
(AD-781836; AFCRL-TR-74-0157; SAR-1) Avail: NTIS CSCL 14/2

The report describes work concerning the design of a liquid Helium cooled infrared spectrometer for an Aerobee sounding rocket payload. The flight is designed to study the diffuse radiation from the Ecliptic and Galactic planes. The designs of the Dewar and electronics systems are not described here. The telescope will be an f3 7-inch aperture Cassegrain system. (Modified author abstract) GRA

N74-32913# Naval Postgraduate School, Monterey, Calif.
DESIGN STUDY OF A STRAIN GAUGE WIND TUNNEL BALANCE M.S. Thesis
Michael John Concannon Mar. 1974 86 p refs
(AD-781402) Avail: NTIS CSCL 14/2

A three-component balance system for use in measuring drag and lift forces as well as pitching moments acting on a wind tunnel model is presently available in the Department of Aeronautics. The original manual counterweight readout procedure was considered obsolete from the standpoint of data acquisition; therefore, a revision was incorporated using strain gage load cells. The design and installation of the electrical readout system is described. Calibration procedures were devised and performed in order to develop a loading output matrix for use with a rapid data acquisition system and compatibility with an analog-digital computer program. (Modified author abstract) GRA

N74-32914# Naval Postgraduate School, Monterey, Calif.
INSTALLATION AND VALIDATION OF AN AIRBORNE DATA ACQUISITION SYSTEM ABOARD A CESSNA 310H USE AS A FLYING LABORATORY M.S. Thesis
William Thomas Broadhurst Mar. 1974 111 p refs
(AD-781409) Avail: NTIS CSCL 14/2

Installation and evaluation of a proposed airborne data acquisition system was accomplished for use aboard the Aeronautical Engineering Department's Cessna 310H. This flying laboratory was obtained for use with the two-course series in flight evaluation techniques to enable students to employ actual flight test methods and to gain an insight into the problems and limitations of flight testing. Static and dynamic analyses were performed on the aircraft's pitot-static boom, and a method was found to dampen vibration of the boom in flight. System calibration procedures were formulated, and the system was tested throughout the flight envelope of the aircraft. The system was found to provide satisfactory data for classroom work and will certainly improve as additional sensors are added. Author (GRA)

N74-32915# Honeywell, Inc., Hopkins, Minn. Government and Aeronautical Products Div.
DESIGN AND DEVELOPMENT OF THE COMBINATION CLASSIFIER PRE-PROCESSOR CCP Final Report
Leigh R. Wold Feb. 1974 87 p
(Contract DAAK02-73-C-0465)
(AD-780925) Avail: NTIS CSCL 15/3

Five advanced development models of a Combination Classifier Pre-processor (CCP) were designed, fabricated, tested and delivered. Each includes a seismic, an acoustic, and a magnetic transducer. The units are self-contained, with batteries for 2-3 months operation, and provide analog output signatures at separate pins of a single interface connector. Author (GRA)

N74-32916# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
RESONANCE RAMAN EFFECT IN WATER VAPOR
P. W. Chan and E. R. Ryder Sep. 1973 80 p refs
(Contract F19628-70-C-0035; AF Proj. 7260)
(AD-781786; AFCRL-TR-73-0616; SR-8) Avail: NTIS CSCL 07/4

The work examines the enhancement or resonance effect of Raman scattering from water vapor using a thermally tuned ruby laser tunable through a range of 0.9A in the vicinity of 6943.8A vibrational-rotational absorption line of water vapor. The Raman scattered signal is observed with a photomultiplier and oscilloscope display scheme, and the incident light intensity and wavelength are monitored by a fast-rise photodiode and Fabry-Perot interferometer, respectively. The water vapor Raman signal has been observed with good signal-to-noise ratio and its Raman scattering cross-section relative to nitrogen has been measured. However, no resonance Raman effect above the shot noise of the photomultiplier is observable. Possible explanations for the lack of observed resonance, both due to theoretical and to experimental reasons, are discussed. (Modified author abstract) GRA

N74-32836 Israel Program for Scientific Translations, Ltd., Jerusalem.
EFFECT OF TEMPERATURE ON THE PERFORMANCE OF AN INTERFERENCE FILTER
A. A. Kmito, V. Ya. Matveev, and I. V. Morozova *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 31-35 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

N74-32840 Israel Program for Scientific Translations, Ltd., Jerusalem.
EFFECT OF THE ATMOSPHERE ON THE ACCURACY OF MEASURING SEA SURFACE TEMPERATURE BY AIRCRAFT-BORNE RADIOMETERS
I. T. Razumovskii *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 66-69 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

N74-32850 Israel Program for Scientific Translations, Ltd., Jerusalem.
IMPROVING THE EFFECTIVE ABSORPTION OF REFERENCE ACTINOMETERS
L. B. Krasilshchikov *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 182-183 Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)
CSCL 04A

N74-32851 Israel Program for Scientific Translations, Ltd., Jerusalem.
A TWO-CHANNEL INFRARED RADIOMETER FOR MEASURING WATER-SURFACE TEMPERATURE AND SOME PROBLEMS ASSOCIATED WITH ITS USE
I. T. Razumovskii and A. A. Sivkov *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 184-190 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

N74-32852 Israel Program for Scientific Translations, Ltd., Jerusalem.

A RADIOMETER DEVICE FOR MEASURING VERTICAL TEMPERATURE GRADIENTS IN THE WATER SURFACE LAYER
V. M. Krasavtsev and A. A. Sivkov *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 191-196 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

N74-32853 Israel Program for Scientific Translations, Ltd., Jerusalem.
AIRBORNE INSTRUMENTS FOR MEASURING REFLECTION: THE SPECTRAL INDICATOMETER
V. I. Korzov and L. B. Krasilshchikov *In its* Atmospheric Radiation Studies (TT-74-50010) 1974 p 197-202 refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 275, 1972 (For availability see N74-32832 22-13)

N74-33072 Israel Program for Scientific Translations, Ltd., Jerusalem.
FILTERING AEROSOLS WITH NATURAL ATMOSPHERIC RADIOACTIVITY THROUGH FIBROUS MATERIALS
B. I. Ogorodnikov, V. I. Skitovich, and E. A. Sitalo *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 245-254 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33074 Israel Program for Scientific Translations, Ltd., Jerusalem.
PRELIMINARY DATA ON THE MEASUREMENT OF THE ATMOSPHERIC AEROSOL CHARACTERISTICS WITH A CENTRIFUGAL SPECTROMETER
Yu. N. Redkin *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 259-272 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33078 Israel Program for Scientific Translations, Ltd., Jerusalem.
A SIMPLE TWO-DIMENSIONAL ANALYZER OF BETA-GAMMA COINCIDENCES IN THE STUDY OF RADIOACTIVE FALLOUT SAMPLES
E. F. Kovnatskii, E. I. Roslyi, and A. N. Silantev *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 293-296 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33079 Israel Program for Scientific Translations, Ltd., Jerusalem.
SPECTROMETRIC METHOD OF MEASURING THE CONCENTRATION OF NATURAL RADIOACTIVE AEROSOLS
V. G. Labushkin, V. I. Popov, and L. S. Ruzer *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 297-309 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33080 Israel Program for Scientific Translations, Ltd., Jerusalem.
ISOTOPE ANALYSIS OF RADIOACTIVE FALLOUT AND AEROSOL SAMPLES BY BETA-SPECTROMETRY
A. N. Silantev, T. V. Polyakova, F. A. Rabotnova, and I. G. Shruratova *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 310-314 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33081 Israel Program for Scientific Translations, Ltd., Jerusalem.
RAPID SYSTEM OF AUTOMATIC PUNCH-TAPE OUTPUT OF INFORMATION FROM THE AI-100-1 ANALYZER
N. F. Mazurin, V. P. Solovev, and V. N. Churkin *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 315-318 ref Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33337 Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France). Lab. de Physique Stellaire.
A SPACECRAFT PAYLOAD FOR SOLAR SPECTROSCOPIC INVESTIGATION
P. Lemaire *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 18 p refs (For availability see N74-33330 22-31)

N74-33342 Imperial Coll. of Science and Technology, London (England). Dept. of Physics.
OBSERVATIONS IN INFRARED ASTRONOMY. REVIEW OF EXPERIMENTAL RESULTS, TECHNIQUES, AND INSTRUMENTAL PROBLEMS
J. Ring *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 24 p (For availability see N74-33330 22-31)

N74-33348 Queen Mary Coll., London (England). Dept. of Physics.
TELESCOPES FOR INFRARED ASTRONOMY FROM SPACE
J. E. Beckman *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 20 p refs (For availability see N74-33330 22-31)

N74-32813 Kansas Univ., Lawrence. Remote Sensing Lab.
PHYSICS OF REMOTE SENSING
Richard K. Moore *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 37 p (For availability see N74-32811 22-13)

N74-32814 European Space Research Organization, Paris (France).
EARTH RESOURCES AND MANNED SPACE SYSTEMS. THE ROLE FOR SPACELAB
J. Plevin *In its* The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 17 p refs (For availability see N74-32811 22-13)

N74-32816 Physics Lab. RVO-TNO, The Hague (Netherlands).
GENERAL ASPECTS OF THE TECHNOLOGY OF REMOTE SENSING. AN INTRODUCTION
G. P. deLoor *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 25 p refs (For availability see N74-32811 22-13)

N74-32817 European Space Research Organization, Paris (France).
PHOTOGRAPHY AND SPACELAB APPLICATION
R. Haydn *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 28 p refs (For availability see N74-32811 22-13)

N74-32826 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
METHODS OF ANALOGUE AND DIGITAL IMAGE ANALYSIS
P. Hartl *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 4 1973 46 p (For availability see N74-32811 22-13)

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

N74-32917* National Aeronautics and Space Administration. Pasadena Office, Calif.
APPARATUS FOR FORMING DRIVE BELTS Patent
Albert Topits, Jr., inventor (to NASA) (JPL) Issued 3 Sep. 1974 10 p Filed 31 Aug. 1973 Supersedes N73-31442 (11 - 22, p 2677) Sponsored by NASA
(NASA-Case-NPO-13205-1; US-Patent-3,833,322; US-Patent-Appl-SN-393525; US-Patent-Class-425-28B; US-Patent-Class-425-35) Avail: US Patent Office CSCL 13H

An apparatus for manufacturing belts, such as seamless belts, is provided, the apparatus has relatively movable rollers that are mounted in an oven. A belt blank, for example, of a thin polyester film, is rotated on the rollers as heat is applied. Four rollers, each mounted on a separate roller assembly, are movable along appropriate tracks while a fifth centrally located roller is stationary. A pair of dc motors are operatively connected to a speed reduction gear assembly to provide a pair of rotating drive shafts that extend into the oven. One rotating shaft drives all of the rollers through a rotational gear assembly while the other drive shaft is capable of positioning the movable rollers through respective rotating threaded shafts. Control devices are provided for controlling the motors while measuring devices are operatively connected to the positional drive shaft to indicate the position of the rollers. Official Gazette of the U.S. Patent Office

N74-32918* National Aeronautics and Space Administration. Pasadena Office, Calif.
TOOL FOR USE IN LIFTING PIN SUPPORTED OBJECTS Patent
Ronald A. Marzek (JPL) and William S. Read, inventors (to NASA) (JPL) Issued 3 Sep. 1974 3 p Filed 18 Jun. 1973 Supersedes N73-26475 (11 - 17, p 2036) Sponsored by NASA
(NASA-Case-NPO-13157-1; US-Patent-3,832,764; US-Patent-Appl-SN-370872; US-Patent-Class-29-203H; US-Patent-Class-29-268) Avail: US Patent Office CSCL 13I

A tool for use in lifting a pin-supported, electronic package mounted in juxtaposition with the surface of an electronic circuit board is described. The tool is configured to be received beneath a pin-supported package and is characterized by a manually operable linkage, including an elongated, rigid link is supported for axial reciprocation and a pivotal link pinned to the body and supported for oscillation induced in response to axial motion imparted to the rigid link. A lifting plate is pivotally coupled to the distal end of the pivotal link so that oscillatory motion imparted to the pivotal link serves to move the plate vertically for elevating the plate into lifting engagement with the electronic package positioned thereabove. Official Gazette of the U.S. Patent Office

N74-32919* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD OF ELECTROFORMING A ROCKET CHAMBER Patent
Anthony Fortini, inventor (to NASA) Issued 27 Aug. 1974 3 p Filed 14 Sep. 1972 Supersedes N72-32501 (10 - 23, p 3099)
(NASA-Case-LEW-11118-1; US-Patent-3,832,290; US-Patent-Appl-SN-289050; US-Patent-Class-204-9) Avail: US Patent Office CSCL 13H

A transpiration cooled rocket chamber is made by forming a porous metal wall on a suitably shaped mandrel. The porous wall may be made of sintered powdered metal, metal fibers sintered on the mandrel or wires woven onto the mandrel and then sintered to bond the interfaces of the wires. Intersecting annular and longitudinal ribs are then electroformed on the porous wall. An interchamber wall having orifices therein is then electroformed over the annular and longitudinal ribs. Parallel longitudinal ribs are then formed on the outside surface of the interchamber wall after which an annular jacket is electroformed over the parallel ribs to form distribution passages therewith. A feed manifold communicating with the distribution passages may be fabricated and welded to the rocket chamber or the feed manifold may be electroformed in place.
Official Gazette of the U.S. Patent Office

N74-32920* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MOLDING APPARATUS Patent
Wilbur C. Heier, inventor (to NASA) Issued 20 Aug. 1974 16 p Filed 11 Apr. 1973 Supersedes N73-31446 (11 - 22, p 2677) Continuation-in-part of US Patent Appl. SN-198763, filed 15 Nov. 1971
(NASA-Case-LAR-10489-2; US-Patent-3,830,609; US-Patent-Appl-SN-350300; US-Patent-Class-425-128; US-Patent-Class-249-83; US-Patent-Class-249-145; US-Patent-Class-249-184; US-Patent-Class-425-415; US-Patent-Class-249-95; US-Patent-Appl-SN-198763) Avail: US Patent Office CSCL 13H

Apparatus for compression molding of thermosetting plastics compositions including interfitting hollow male and female components is reported. The components are adapted to be compressed to form a rocket nozzle in a cavity. A thermal jacket is provided exteriorly adjacent to the female component for circulating a thermal transfer fluid to effect curing of a thermosetting plastics material being molded. Each of the male and female components is provided with suitable inlets and outlets for circulating a thermal transfer fluid.
Official Gazette of the U.S. Patent Office

N74-32921* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
JOURNAL BEARINGS Patent
Fredrick T. Schuller and Warren A. Moore, inventors (to NASA) Issued 20 Aug. 1974 14 p Filed 30 Mar. 1973 Supersedes N73-20533 (11 - 11, p 1298) Continuation-in-part of US Patent Appl. SN-238264, filed 27 Mar. 1972
(NASA-Case-LEW-11076-2; US-Patent-3,830,552; US-Patent-Appl-SN-346483; US-Patent-Class-308-121; US-Patent-Appl-SN-238264) Avail: US Patent Office CSCL 13I

A plurality of bearing sectors are mounted in a housing. Each sector functions as a lobed area in the bearing to obtain the required lubricant film geometry.
Official Gazette of the U.S. Patent Office

N74-32922 Comptroller General of the United States, Washington, D.C.
NUMERICALLY CONTROLLED INDUSTRIAL EQUIPMENT: PROGRESS AND PROBLEMS Report to the Congress
24 Sep. 1974 69 p refs
(B-140389) Avail: US General Accounting Office, Room 4522, 441 G Street, N. W., Washington, D. C. 20548 $1.00

The Government Accounting Office (GAO) conducted a survey of the military services and two contractor plants to identify areas where numerical control can increase productivity. The items of industrial equipment which are considered to be numerically controlled (NC) are identified. It was determined that advancement of NC may be limited because users are confronted with many different NC systems and different standards. Some of the subjects discussed are: (1) the role of the Department of Defense in developing NC, (2) systems for identifying a need for NC, (3) planning for specific NC equipment, and (4) management of NC machines in use. Author

N74-32923*# Battelle Columbus Labs., Ohio.
CHARACTERIZATION OF METALS MELTING DISCS: SKYLAB EXPERIMENT M551
Robert E. Monroe 4 Dec. 1973 109 p
(Contract NAS8-28725)
(NASA-CR-120421) Avail: NTIS HC $8.50 CSCL 22C

Information developed to characterize flight and ground based samples from the metals melting experiment is detailed in this report. Included are the characteristics determined by nondestructive examination, visual observation, metallographic examination and posttest measurements. Comparisons of the flight and ground based discs showed that an electron beam heat source can be used successfully in zero gravity for cutting, welding, or melting. Few differences were observed that could be attributed to the absence of gravity in these operations. Author

N74-32924*# Westinghouse Research Labs., Pittsburgh, Pa.
RESEARCH STUDY ON MATERIALS PROCESSING IN SPACE, EXPERIMENT M512 Final Report, 15 Jun. 1972 - 30 Nov. 1973
M. Rubenstein, R. H. Hopkins, and H. B. Kim 15 Jan. 1973 105 p refs

(Contract NAS8-28727)
(NASA-CR-120418) Avail: NTIS HC $8.25 CSCL 13H

Gallium arsenide, a commercially valuable semiconductor, has been prepared from the melt (M.P. 1237C), by vapor growth, and by growth from metallic solutions. It has been established that growth from metallic solution can produce material with high, and perhaps with the highest possible, chemical homogeneity and crystalline perfection. Growth of GaAs from metallic solution can be performed at relatively low temperatures (about 600C) and is relatively insensitive to temperature fluctuations. However, this type of crystal growth is subject to the decided disadvantage that density induced convection currents may produce variations in rates of growth at a growing surface. This problem would be minimized under reduced gravity conditions. Author

N74-32925*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
REFINEMENT CONTROL IN TIG ARC WELDING Patent Application
William F. Iceland (N. Am. Rockwell Corp.) and Edwin L. Whiffen, inventors (to NASA) (N. Am. Rockwell Corp.) Filed 13 Nov. 1973 15 p
(Contract NAS9-150)
(NASA-Case-MSC-19095-1; US-Patent-Appl-SN-415486) Avail: NTIS HC $4.00 CSCL 13H

A method for controlling the frequency of direct current pulse welding voltages is discussed. The system is used with electric arc welding in an inert gas environment to produce at uniform fine grained structure in the welded material. The procedure for achieving weld puddle agitation without mechanically agitating the weld is described. The steps for varying the frequency of the arc gas voltage, selecting the frequency which produces the maximum value of arc gas voltage, and maintaining the operating frequency at this maximum frequency to produce maximum weld puddle agitation are explained. NASA

N74-32926*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
APPARATUS FOR POSITIONING MODULAR COMPONENTS ON A VERTICAL OR OVERHEAD SURFACE Patent Application
Cyrus C. Haynie (N. Am. Rockwell Corp.) and Samuel V. Messineo, inventors (to NASA) (N. Am. Rockwell Corp.) Filed 30 Aug. 1974 13 p Sponsored by NASA
(NASA-Case-LAR-11465-1; US-Patent-Appl-SN-502137) Avail: NTIS HC $4.00 CSCL 13I

An apparatus for holding several modular components against a surface is described. A flexible fixture prepositions the components and a vacuum develops a uniform pressure which presses and holds the fixture and objects in place. The surface may be curved, vertical, or overhead. Diagrams of the device are provided. NASA

N74-32927# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
ANALYSIS OF NON-CIRCULAR GAS JOURNAL BEARINGS
O. Pinkus Feb. 1974 54 p refs
(TAE-196) Avail: NTIS HC $5.75

A computer program for solving the compressible Reynolds Equation including journal center velocities was set up. The equation was then applied to elliptical and 3-lobe designs. Solutions were obtained for both the circular and noncircular configurations under both steady and non-steady conditions. It is shown that while in general noncircular bearings have a poorer load capacity, nevertheless at high eccentricity ratios, when load capacity is of concern, the elliptical bearing is not worse than the circular design. On the other hand from the standpoint of stability the noncircular designs offer a significant advance in their spring and damping properties, the improvement being most pronounced at low eccentricities when instability is most often encountered. Suggestions are made on how to extract the maximum load capacity along with improved stability properties in the application of noncircular gas bearings. Author

N74-32928# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
ULTRASONIC INSPECTION AND CONTROL OF THE WELDMENTS IN CROSSED STEEL BARS SUPPORTING STRUCTURES
L. X. Nepomuceno and M. F. Barbosa 31 Jul. 1973 11 p In PORTUGUESE; ENGLISH summary
(TR-7307.663) Avail: NTIS HC $4.00

The equipment and procedures are described which were used for inspecting the weldments of crossed steel bars. Schematics of the results, and photos of the echograms are included. Author

N74-32929*# Little (Arthur D.), Inc., Cambridge, Mass.
FEASIBILITY STUDY FOR THE MANUFACTURE OF ZERO GRAVITY PHARMACEUTICLES, IMMUNOLOGICAL, AND VIRAL AGENTS Final Report
29 Aug. 1974 67 p refs
(Contract NAS8-29874)
(NASA-CR-120424) Avail: NTIS HC $6.50 CSCL 13H

The feasibility of extracting, isolating, purifying, separating, or preparing medical and biological products of high socio-economic value in space was studied. In particular, the study was designed to concentrate on the isolation or purification of virals, pharmaceutical and immunological agents by means of electrophoresis, as the Apollo 16 flight demonstrated that a mixed population of latex spheres (.2 and .8 microns) could be successfully separated by electrophoresis in space and without sedimentation with minimal convection. This prompted NASA scientists to look into the possibility of carrying out types of biochemical experiments that would utilize space for medical purposes. Author

N74-32930*# Little (Arthur D.), Inc., Cambridge, Mass.
FEASIBILITY STUDY FOR THE MANUFACTURE OF ZERO GRAVITY PHARMACEUTICALS, IMMUNOLOGICAL, AND VIRAL AGENTS, APPENDICES
29 Aug. 1974 238 p refs
(Contract NAS8-29874)
(NASA-CR-120425) Avail: NTIS HC $15.00 CSCL 13H

For abstract, see N74-32929.

N74-32931*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TWO-DIMENSIONAL GAUSSIAN PROCESSES APPLIED TO THE DETERMINATION OF CONTACT BETWEEN LUBRICATED ROLLING SURFACES
Steven M. Sidik 1974 42 p refs Presented at the 134th Ann. Meeting of the Amer. Statist. Assoc., St. Louis, 26-29 Aug. 1974
(NASA-TM-X-71598; E-7166) Avail: NTIS HC $3.25 CSCL 13I

The effectiveness of a lubricant film preventing metallic contact between two rolling surfaces (such as in ball bearings) as a function of surface roughness parameters was investigated. The parameters considered are the spectral moments of the two-dimensional surface obtained by superposition of the two rolling surfaces. The peak height distribution, estimation of one-dimensional profile spectral moments, and the estimation of two-dimensional surface moments from several profile measurements were considered. Also given is an asymptotic relation between the mean film thickness and contact occurrences. Author

N74-32932*# Boeing Aerospace Co., Seattle, Wash. Research and Engineering Div.
DEEP FLAWS IN WELDMENTS OF ALUMINUM AND TITANIUM Contractor Report, Jun. 1971 - Oct. 1972
J. N. Masters, W. L. Engstrom, and W. D. Bixler Apr. 1974 221 p refs
(Contract NAS3-14386)
(NASA-CR-134649; D180-18189-1) Avail: NTIS HC $14.25 CSCL 13H

Surface flawed specimens of 2219-T87 and 6Al-4V STA titanium weldments were tested to determine static failure modes, failure strength, and fatigue flaw growth characteristics. Thicknesses selected for this study were purposely set at values where, for most test conditions, abrupt instability of the flaw at fracture would not be expected. Static tests for the aluminum weldments were performed at room, LN2 and LH2 temperatures. Titanium static tests for tests were performed at room and LH2 temperatures. Results of the static tests were used to plot curves

relating initial flaw size to leakage- or failure-stresses (i.e. 'failure' locus curves). Cyclic tests, for both materials, were then performed at room temperature, using initial flaws only slightly below the previously established failure locus for typical proof stress levels. Cyclic testing was performed on pairs of specimens, one with and one without a simulated proof test cycle. Comparisons were made then to determine the value and effect of proof testing as affected by the various variables of proof and operating stress, flaw shape, material thickness, and alloy. Author

N74-32933# Commissariat a l'Energie Atomique, Saclay (France). Dept. de Technologie.

PROGRESS REALIZED IN THE AUTOMATIC CONTROL BY ULTRASONICS OF AUSTENITIC STAINLESS STEEL WELDS USING FOCALIZED TRANSDUCERS

R. Saglic and M. Roule [1974] 4 p In FRENCH Presented at the 7th Intern. Conf. and Exhibition on Nondestructive Testing, Warsaw, 4-8 Jun. 1973

(CEA-Conf-2449; Conf-730606-8) Avail: AEC Depository Libraries HC $3.00

Ultrasonic control of austenitic stainless steel welds is almost impossible with classical transducers because of the reflections at the grain boundary which gives a signal-to-noise ratio that is too weak. The uses of focalizing transducers makes it possible, on one hand, to improve the signal-to-noise ratio by a value which can reach 40 db and, on the other hand, because of the fineness of the ultrasonic beam obtained, to dimension the faults with a precision sharply superior to that obtainable with a plane transducer. Examples of the industrial realization of automatic devices using focalizing transducers for control of angle welds, T welds, and streak welds on small tubes are presented. A method is available for ultrasonic control in the case of very absorbant materials or materials having a strong reflectivity at the grain boundaries. The dimensioning of faults becomes more reliable and more precise. Author (NSA)

N74-32934# Defence Research Information Centre, Orpington (England).

AN EXTRACT FROM THE REPORT ON THE WORKING PARTY ON GAUGING FOR TAPE CONTROLLED MACHINE TOOLS

Dec. 1974 19 p

(AD-781144; BR37714; S/T-Memo-18-73) Avail: NTIS CSCL 13/8

The investigation described relates to the development of a piece of equipment which when integrated into a numerically controlled drilling machine prevents manufacture proceeding if the desired x and y table co-ordinate movements are out of tolerance. By concentrating in this area it was hoped to reduce scrap resulting from errors in table positioning and similarly by providing additional confidence to this part of the manufacturing operation, it was expected to materially reduce inspection costs. Possible applications concern components manufactured in small batches having a large number of holes to be drilled, bored, countersunk, etc. such as is found in the aircraft industry. GRA

N74-32935# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE CHARACTER OF METAL FLOW WHEN PRESSING TITANIUM ALLOYS IN ISOTHERMAL CONDITIONS

V. V. Boitsov, Yu. G. Kalpin, and S. Z. Figlin 25 Jun. 1974 10 p refs Transl. into ENGLISH from Kuznechno-Shtampovochnoe Proizvod. (USSR), no. 11, Nov. 1971 p 3-5

(AD-781670; FTD-HT-23-1585-74) Avail: NTIS CSCL 13/8

The article provides results of a study of the deformation of alloys VT3-1 and VT-8 in isothermal conditions. GRA

N74-33401* General Electric Co., Philadelphia, Pa.

FREE SUSPENSION PROCESSING OF OXIDES TO FORM AMORPHOUS OXIDE MATERIALS, APPENDIX B

G. Wouch *In its* Study for Identification of Beneficial Uses of Space (BUS), Phase 2, Vol. 2, Book 2, Sect. 5 1 Nov. 1973 24 p refs (For availability see N74-33399 22-34)

CSCL 13H

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

N74-32936# Joint Publications Research Service, Arlington, Va.

LASERS AND THEIR APPLICATION

8 Aug. 1974 21 p refs Transl. into ENGLISH from Prib. Tekh. Eksp. (Moscow), no. 5, 1973 p 188-199

(JPRS-62679) Avail: NTIS HC $4.25

Descriptions are given of a high pressure cathode preionization pulse CO2 laser, an organic dye accessory inverter for LGI-21 serial nitrogen laser, application of lasers for high speed photography of fast processes, Fabry-Perot laser interferometer for measuring plasma density in unsteady flow. Author

N74-32937*# National Aeronautics and Space Administration. Pasadena Office, Calif.

SCHOTTKY BARRIER LASER ENERGY CONVERTER Patent Application

Richard J. Stirn (JPL) and Yea-Chuan M. Yeh, inventors (to NASA) (JPL) Filed 27 Aug. 1974 15 p

(Contract NAS7-100)

(NASA-Case-NPO-13390-1; US-Patent-Appl-SN-501013) Avail: NTIS HC $4.00 CSCL 20E

A Schottky barrier (SB) type cell for conversion of laser beam energy of wavelength of 0.6 microns and less is described. The cell consists of a thin layer of semiconductor material with a band gap of about 2eV or more, and a very thin layer of semitransparent metal on the order of 100 deg. A or less, deposited on the semiconductor material. Contacts are deposited on the bottom side of the semiconductor material and on top of the metal layer, the latter contact in the form of the grid structure. NASA

N74-32938*# United Aircraft Corp., Norwalk, Conn. Norden Div.

LASER SPACE RENDEVOUS AND DOCKING TRADE-OFF Quarterly Progress Report

[1974] 43 p

(Contract NAS8-30738)

(NASA-CR-120440; Rept-1247-R-0003) Avail: NTIS HC $5.25 CSCL 20E

A spaceborne LADAR sensor, which will meet the requirements for rendezvous and docking with a cooperative object in synchronous orbit is presented. The sensor is being configured around a pulsed CO2 laser which can be constructed and deployed using technology which presently exists or is being developed, and which appears to lend itself very well to the envisioned family of space missions. In order to determine the applicability of the type of sensor being considered, the performance of a family of candidate sensors is being traded off as a function of size, weight, and power consumption. The maximum ranges being considered are 50, 100, 200, and 300 nautical miles. Author

N74-32939*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

APPLICATIONS OF TUNABLE HIGH ENERGY/PRESSURE PULSED LASERS TO ATMOSPHERIC TRANSMISSION AND REMOTE SENSING

R. V. Hess and R. K. Seals Sep. 1974 17 p refs

(NASA-TM-X-72010) Avail: NTIS HC $3.00 CSCL 20E

Atmospheric transmission of high energy C12 O2(16) lasers were improved by pulsed high pressure operation which, due to pressure broadening of laser lines, permits tuning the laser 'off' atmospheric C12 O2(16) absorption lines. Pronounced improvement is shown for horizontal transmission at altitudes above several kilometers, and for vertical transmission through the entire atmosphere. The atmospheric transmission of tuned C12 O2(16) lasers compares favorably with C12 O2(18) isotope lasers and CO lasers. The advantages of tunable, high energy, high pressure pulsed lasers over tunable diode lasers and waveguide lasers, in combining high energies with a large tuning range, are evaluated for certain applications to remote sensing of atmospheric constituents and pollutants. Pulsed operation considerably increases the signal to noise ratio without seriously affecting

the high spectral resolution of signal detection obtained with laser heterodyning. Author

N74-32940# California Univ., Livermore. Lawrence Livermore Lab.
THEORETICAL DESCRIPTION OF THE INTERACTION OF A PULSED LASER AND A TARGET IN AN AIR ENVIRONMENT
A. Edwards, N. Ferriter, J. A. Fleck, Jr., and A. M. Winslow 26 Nov. 1973 104 p refs
(Contract W-7405-eng-48)
(UCRL-51489) Avail: NTIS HC $5.45

A comprehensive theoretical modeling is described for a pulsed laser beam interacting with an aluminum target in the persence of an air atmosphere. Calculations include the details of target heating from ambient temperature through vaporization and ionization and allow the description of laser-supported detonation (LSD) waves in air. Calculations are based on a nonequilibrium three-temperature model. They also include the effects of two-dimensional Lagrangian hydrodynamics, diffusion of electron and heavy particle temperatures, and accurate equations of state for air and aluminum. The resulting model yields realistic values of the maintenance threshold for LSD waves in air. Calculated detonation-wave velocities, surface pressures, and two-dimensional wave properties are in good agreement with experimental measurements. This leads to confidence in the code as an extrapolating tool for the effects of high-power lasers. The results obtained from the target interaction calculations have been used as input for material-response calculations that determine the nature of high-power laser damage to aluminum plates. Author (NSA)

N74-32941# GTE Sylvania, Inc., Mountain View, Calif.
FREQUENCY-DOUBLED NEODYMIUM-YAG PUMPED DYE STUDY Final Report, Mar. - Sep. 1973
Eugene O. Ammann, C. David Decker, and Joel Falk Apr. 1974 87 p refs
(Contract F29601-73-C-0067; AF Proj. 3326)
(AD-780594; AFWL-TR-73-280) Avail: NTIS CSCL 20/5

The goal of this program was to obtain 125 mJ (minimum) pulses in the .53 to .70 micrometer region of the spectrum. It was originally envisioned by the AFWL in their RFP that this goal would be accomplished by frequency doubling the 1.32 micrometer output from a pulsed Nd:YAG laser system. However, such an approach is difficult for at least two reasons. First, competition from the 1.06 micrometer transition in Nd:YAG makes it difficult to obtain the required 1.32 micrometer pulse energies in a low-order transverse mode. Secondly, a damage resistant, 90 degree phase-matchable nonlinear crystal for doubling 1.32 micrometer is not readily available. Thus the approach which was recommended in our proposal and which was followed on this program was to (1) generate 1.06 micrometer pulses with a Nd:YAG oscillator/amplifier chain, (2) generate second-harmonic pulses at .53 micrometer using deuterated cesium dihydrogen arsenate as the nonlinear material, and (3) use the 0.53 micrometer pulses to pump a dye laser. GRA

N74-32942# International Laser Systems, Inc., Orlando, Fla.
CUEING DESIGNATOR Technical Report, Dec. 1973 - May 1974
R. J. Manning May 1974 84 p refs
(Contract DAAH01-74-C-0388)
(AD-780937; R7185) Avail: NTIS CSCL 19/5

The design concept for a laser cueing designator system is described wherein the objective is to arrive at a very low cost laser design which would permit the use of a laser for cueing of targets. The objective is not precise laser designation of tactical targets such as vehicles, but rather the designation of target areas to attacking forces. A laser receiver would provide direction-of-arrival information to the designated target. The final laser design concept resulted in a five pound cueing laser having an estimated unit price of $500 in quantities of 5000 and $1,000 in quantities of 100. (Modified author abstract) GRA

N74-32943# United Aircraft Corp., East Hartford, Conn. Research Labs.
INVESTIGATION TO DETERMINE CHARACTERISTICS OF A STABLE-FREQUENCY PULSED REGENERATIVE-AMPLIFIER CO2 LASER TRANSMITTER Final Report, 10 Oct. 1972 - 28 Oct. 1973
A. R. Clobes, P. J. Berger, R. T. Brown, and C. J. Buczek Jan. 1974 79 p refs
(Contract N60921-70-C-0219)
(AD-781737; UARL-M921525-12) Avail: NTIS

The primary objective of the work is to investigate the feasibility of injection locking a low-power, frequency-stable, CO2 master oscillator to a high-pressure, pulsed electric discharge CO2 laser. While the exploratory work is done at low pulse repetition rates (PRF), the laser design and experimental configuration is guided by the ultimate goal of high PRF operation. To this end, a secondary objective of the program is to investigate the problems associated with high PRF operation. GRA

N74-32944# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foregin Technology Div.
EFFECT OF AMPLIFYING BACKSCATTERING IN BODIES PLACED IN A MEDIUM CONTAINING RANDOM INHOMOGENEITIES
A. G. Vinogradov, Yu. A. Kravtsov, and V. I. Tatarskii 17 Jun. 1974 16 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radiofiz. (USSR), v. 16, no. 7, 1973 p 1064-1070
(AD-781653; FTD-HT-23-924-74) Avail: NTIS CSCL 20/5

A description is given of the effect of amplifying backscattering in bodies placed in a randomly-refracting medium having largescale inhomogeneities. This effect is explained by the correlation of insensities of the incident and scattered waves which pass through one and the same medium inhomogeneity. Amplification of backscattering is accompanied by attentuation of the average intensity of the scattered field at angles close to n. The full power of the scattered field remains the same as that when there are no random inhomogeneities. Besides reflection from individual bodies, the scattering on a set of many diffusers and on rough surfaces is examined. In these cases, as when using an input aperture of finite dimensions, the amplification effect can be smahsed. Author (GRA)

N74-32945# Army Missile Command, Redstone Arsenal, Ala. Physical Sciences Directorate.
NEUTRON AND GAMMA-RAY FLUXES FOR PUMPING LASERS
T. G. Roberts, R. A. Shatas, and J. D. Stettler 1 May 1974 16 p refs
(DA Proj. 1T6-62609-A-308)
(AD-781475; RR-74-3) Avail: NTIS CSCL 20/5

The feasibility of using an electron-beam-triggered thermonuclear explosion to produce neutron and gamma-ray fluxes of interest for studies of neutron pumped gamma lasers and gamma-ray pumped HF and Xe lasers is analyzed. An experimental scheme is proposed which seems to satisfy all the requirements for use of a high energy electron beam. (Modified author abstract) GRA

N74-32946# Air Force Weapons Lab., Kirtland AFB, N.Mex.
PROPAGATION OF HIGH-ENERGY LASER BEAM IN THE ATMOSPHERE Final Report, Sep. 1972 - Jun. 1973
Charles B. Hogge Jun. 1974 65 p refs
(AF Proj. 3326)
(AD-781763; AFWL-TR-74-74) Avail: NTIS CSCL 20/6

Atmospheric turbulence can affect the propagation of laser beams of any power. Thermal blooming, a nonlinear propagation process, can seriously degrade high-energy beams. These two processes are reviewed in detail, with emphasis on parametric effects such as aperture size wavelength, and focal distance. Included in the discussion are such new topics as supersonic slewing and stagnation zone problems. Author (GRA)

N74-32947# Naval Intelligence Support Center, Washington, D.C. Translation Div.
AN APPROXIMATE DETERMINATION OF INVERSION POPULATION AND OF THE AMPLIFICATION FACTOR OF GAS DURING ADIABATIC EXPANSION IN THE NOZZLE
G. B. Gembarzhevskiy 3 May 1974 9 p refs Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (Moscow), no. 3, 1973 p 35-40
(AD-781437; NISC-Trans-3549) Avail: NTIS CSCL 20/5

The article proposes to obtain analytical expressions for the

power dependence and amplification factor of a gasdynamic laser upon the shape and dimensions of the nozzle, deceleration parameters and gas content valid for a wide scale of changes in these parameters; these analytical expressions should be arrived at by means of calculating the dependence of kinetic equations coefficients upon time. GRA

N74-32948# Wisconsin Univ., Madison. 07/4
CHEMICAL LASER STUDIES OF UNIMOLECULAR REACTION DYNAMICS
Eric R. Sirkin and Michael J. Berry 5 Jun. 1974 7 p
(Contract N00014-67-A-0128-0022; NR Proj. 051-521)
(AD-781731; TR-2) Avail: NTIS

Measurements of hydrogen fluoride vibrational state populations in several unimolecular elimination laser systems indicate that 10-15% of the reaction exoergicity is channeled into HF vibration. The mode of reactant formation influences energy partitioning in CH3CH2F(+) decomposition. Author (GRA)

N74-32949# Army Foreign Science and Technology Center, Charlottesville, Va.
LASER DETECTION AND COMMUNICATION
M. V. Dulin 21 Feb. 1974 72 p refs Transl. into ENGLISH from an unidentified Russian monograph
(AD-781210; FSTC-HT-23-74-73) Avail: NTIS CSCL 20/5

Contents: Physical properties of laser radiation, application of lasers in detection, and the use of lasers in systems of communication (laser communication). GRA

N74-32950# Naval Research Lab., Washington, D.C.
DOCUMENTATION OF PROP E, A COMPUTER PROGRAM FOR THE PROPAGATION OF HIGH-POWER LASER BEAMS THROUGH ABSORBING MEDIA Final Report
Peter B. Ulrich, John N. Hayes, J. Harrison Hancock, and Jeanne T. Ulrich 29 May 1974 54 p
(NRL Proj. R05-31)
(AD-781647; NRL-7681) Avail: NTIS CSCL 20/6

The report details the numerical methods employed in a solution of the problem of high-power laser-beam propagation. A transformation of the partial differential equation for the light beam is used which differs from that of a previous study of the problem and which offers a versatility allowing a study of highly distorted beams to be made. A detailed description of the subroutines and their operation is given along with flow charts and FORTRAN listings. (Modified author abstract) GRA

N74-32951# Naval Intelligence Support Center, Washington, D.C. Translation Div.
THE ROLE OF NON-RESONANCE EXCHANGE PROCESSES IN GAS-DYNAMIC LASER
A. S. Biryukov and L. A. Shelepin 19 Apr. 1974 15 p refs Transl. into ENGLISH from Zh. Prikl. Mekh. Tekn. Fiz. (USSR), no. 4, 1973 p 25-32
(AD-781443; NISC-Trans-3543) Avail: NTIS CSCL 20/5

It was demonstrated previously that non-resonance vibrational exchange plays an important role in gas lasers; during scattering of gaseous mixtures, non-resonance exhange processes lead to appreciable redistribution of vibratonal level populations and to variation of effective relaxation times. The possibilities of gas-dynamic lasers, related to adequate consideration of non-resonance exchange, are considered in the given investigation. For analysis of the kinetics of the processes the authors use a system of equations of the balance of vibration energies for a mixture of gases whose molecules are simulated by two types of harmonic oscillators. The presence of Boltzmann distribution of populations by levels with their own vibrational-band temperature is assumed in each of the components. GRA

N74-32952# Naval Intelligence Support Center, Washington, D.C. Translation Div.
EXPERIMENTAL INVESTIGATIONS OF THE LIGHT AMPLIFICATION FACTOR IN CO2 + N2 + He(H2O) MIXTURES DURING EXPANSION IN A SUPERSONIC NOZZLE
G. V. Gembarzhevskiy, N. A. Generalov, and G. I. Kozlov 19 Apr. 1974 14 p refs Transl. into ENGLISH from Zh. Prikl. Mekh. Tekn. Fiz. (USSR), no. 4, 1973 p 18-24
(AD-781445; NISC-Trans-3544) Avail: NTIS CSCL 20/5

In the present investigation the light amplification factor of a mixture of 10% CO2 + 40% N2 50% He was measured during supersonic expansion over a wide range of variation of experimental conditions: total temperature T = 800-3600K, and gas pressure P = 2.5-40 atm, where the relative nozzle cross section assumed several fixed values $S/S^* = 18.2, 36.2$, and 49 and 59, where S^* is the critical nozzle cross section, and S is the cross section in the measurement zone. A mixture of 10% CO2 + (90 - X%) N2 + X% H2O (where X = 0-5%) was investigated in the total temperature range of T = 800-2200K and total pressure range of P = 1.5-40 atm with relative nozzle cross sections of S/S = 18.2, 36.2, and 59. The data obtained for the amplification factor are compared with values which were calculated by a previously proposed method. GRA

N74-32953# Naval Intelligence Support Center, Washington, D.C.
LIGHT AMPLIFICATION IN A PULSED GAS-DYNAMIC LASER USING ACETYLENE-AIR COMBUSTION PRODUCTS
G. I. Kozlov, V. N. Ivanov, and A. S. Korablev 27 Mar. 1974 11 p refs Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (USSR), v. 65, no. 1(7), 1973 p 82-88
(AD-781442; NISC-Trans-3530) Avail: NTIS CSCL 20/5

The amplification coefficents for the products of burning acetylene-air mixtures and expansion through a supersonic nozzle have been measured as functions of the stagnation parameters and the acetylene concentration in the original mixture. The largest amplification coefficent is 0.006/cm, which is nearly three times greater than the predicted value for our particular nozzle geometry. It is shown that when a shock wave propagates in a gas having a population inversion there is an initial increase in the amplification followed by a rapid transition from amplification to absorption. GRA

N74-32954# Naval Intelligence Support Center, Washington, D.C. Translation Div.
A NON-SELF-SUSTAINED STATIONARY GAS DISCHARGE IN N2-CO2 MIXTURES AT AN ATMOSPHERIC PRESSURE AND IONIZATION BY AN ELECTRON BEAM
E. P. Velikhom, S. A. Golubev, Yu. K. Zemtsov, A. F. Pal, and I. G. Persiyantsev 3 May 1974 10 p refs Transl. into ENGLISH from Zh. Eksperim. Teor. Fiz. (Moscow), v. 65, no. 2(8), 1973
(AD-781438; NISC-Trans-3548) Avail: NTIS CSCL 20/5

An investigation of an induced gas discharge in N2-CO2 mixtures under atmospheric pressure is reported. A beam of electrons with an energy of about 100 kev and a current of about 50 microampere is used as an external ionizer. A stable burning of such a discharge under stationary conditions was achieved in this experiment. Subsequent analysis indicates possible use in the future of such discharges for a combined pumping of CO2 lasers. GRA

N74-32955# Naval Intelligence Support Center, Washington, D.C. Translation Div.
SPECTRAL KINETICS OF GENERATION OF SOME ORGANIC LIQUID LASERS
B. S. Neporent, V. B. Shilov, and G. V. Lukomskii 27 Mar. 1974 11 p refs Transl. into ENGLISH from Opt. i Spektroskopiya (Moscow), v. 35, no. 3, 1973 p 535-539
(AD-781440; NISC-Trans-3529) Avail: NTIS CSCL 07/4

The red shift of the spectra of generation of rhodamine 6Zh and cryptocyanine solutions when excited by monopulses of solid body lasers is investigated. The relaxation character of the shift is confirmed by the dependence of the magnitude of spectra shift on pumping power. The decisive role of intramolecular relaxations is confirmed by the retention of the effect when the viscosity and temperature of the solutions change within broad limits. The absence of correlation between the shift of generation spectra and boundary losses in the resonator is established. GRA

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N74-32956+ Aeronautical Research Labs., Melbourne (Australia).

BIBLIOGRAPHY ON STRESS WAVE EMISSION, 1950 - 1973

G. G. Martin Feb. 1974 70 p refs
(ARL/Met-Bibl-2) Avail: NTIS HC $6.50

Known sources of information relating to stress wave emission were collected and listed under two headings-articles readily available in Australia and those available elsewhere. Author

N74-32957 Creusot-Loire, Paris (France). Dept. Etudes.

PRODUCTION AND CHARACTERIZATION OF THIN METALLIC CONTINUOUS SHEETS WITH HIGH ELASTIC RESISTANCE INFLUENCE OF SURFACE TREATMENTS Final Report [REALISATION ET CARACTERISATION DE FEUILIES METALLIQUES MINCES, CONTINUES ET A TRES HAUTE RESISTANCE INFLUENCE DES TRAITEMENTS DE SURFACE EFFECTUES A L'IFC]

J. Morlet Aug. 1973 34 p In FRENCH
(Contract DGRST-71-7-3225)
Avail: Issuing Activity

Three alloys with high elastic limit were selected for their adequate properties for rolling into continuous thin sheets. An austenitic cobalt base steel (40% Co, 20% Cr, 16% Ni, 7% Mo) and two martensitic maraging steels were chosen (Phynox, Durimphy, marphynox). The roll set up on industrial scale produced continuous sheets of thicknesses 50 and 25 microns with resistance to failure higher than 250 h bar and 10 microns with resistance to failure higher than 200 h bar. The mechanical properties were tested in extension bending modulus of elasticity. Electron scanning microscopy was used to study the influence of various chemical surface treatments on reinforcing sheets and with a view to improving the link between metals and monomolecular materials. ESRO

N74-32958 Ugine Aciers, Ugine (France). Centre de Recherches Metallurgiques.

ELABORATION AND TRANSFORMATION OF SUPERCONDUCTING ALLOYS Nb-Ti Final Report [MISE AU POINT DE METHODES D'ELABORATION ET DE TRANSFORMATION D'ALLIAGES SUPRACONDUCTEURS Nb-Ti]

J. Schmuck Nov. 1973 127 p refs In FRENCH
(Contract DGRST-71-7-2775)
Avail: Issuing Activity

A semi-industrial process for producing supraconducting alloys Nb-Ti is presented. Homogenous ingots and wires clad with Cu were obtained. The thermomechanical treatment effects are detailed. Two oxygen contents were used for Nb alloys with 35, 44, 53, 57 and 65% Ti in weight. Mechanical characteristics evolution after various thermal treatments is presented. The results of dilutometry, and optical and electronic micrography are discussed. The phase transformation effects are correlated to the mechanical properties of implementation control. Optimization of the process is described in regard to maximum ductility. ESRO

N74-32959 Paris Univ. (France). Lab. de Metallurgie des Surfaces.

SEARCH FOR SURFACE ALLOYS AND ESPECIALLY REFRACTORY ALLOYS FORMED BY DEPOSITION OF ULTRATHIN LAYERS AND ADSORPTION LAYERS Final Report [RECHERCHE D'ALLIAGES DE SURFACE ET EN PARTICULIER D'ALLIAGES DE METAUX REFRACTAIRES FORMES LORS DU DEPOT DE COUCHES ULTRAMINCES ET DE COUCHES D'ADSORPTION]

G. E. Rhead Aug. 1973 41 p refs In FRENCH; ENGLISH summary
(Contract DGRST-71-7-2782)
Avail: Issuing Activity

The existence of surface alloys, surface layers with thickness of the order of one atom and formed from the elements of a substrate and another metal deposited from the vapor phase, was demonstrated for the system Au-Pb. Search techniques for alloys by Auger electron spectroscopy and low-energy electron diffraction are described. A principal aim was to seek alloys of refractory metals, in view of their possible technological applications. Several substrate-condensate systems were examined: Cu-Bi, Au-Pb, Ni-Pb, W-Al, W-Ni, No-S, and Nb-Sn. A large number of surface structures was determined. The preparation of clean surfaces of refractory metals demands special precautions. Among these metals niobium seems the most promising in connection with alloy formation. Author (ESRO)

N74-32960 Rouen Univ. (France). Lab. de Microscopie Ionique.

STUDY OF DEFECTS BY ION FIELD MICROSCOPY Final Report [ETUDE DES DEFAUTS PAR MICROSCOPIE IONIQUE A CHAMP]

J. Gallot Dec. 1973 13 p refs In FRENCH
(Contract DGRST-70-0-2205)
Avail: Issuing Activity

The development of two ion field microscopes is presented. Improvements were focused on the sample temperature at 21 K by use of a hydrogen microliquefactor and image recording using a channel plate image intensifier. Field effect evaporation by pulsed processes was also introduced. Planar and linear defects were studied and the results are compared to the theory of contrast variation induced by dislocation and packing faults. No systematic search was made of electric field variation influence on dislocation distribution and defect bandwidth. ESRO

N74-32961# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.

THE ROLE OF MICROSTRUCTURE IN DETERMINING FRACTURE TOUGHNESS AND FATIGUE PROPERTIES OF HIGH STRENGTH TITANIUM ALLOYS

Albert Tobin Aug. 1974 108 p refs
(RE-485) Avail: NTIS HC $8.50

The general theory of fatigue and flaw growth is examined and related to fracture mechanics parameters. Attempts to correlate microstructural parameters to macroscopic properties and fracture mechanics parameters are made. A general review of the physical metallurgy of titanium alloys is presented with primary emphasis on Ti-6Al-4V and Ti-6Al-6V-2Sn. Emphasis is also placed on the roles of microstructural, chemical, and textural variations in controlling the fracture toughness and fatigue crack growth rate. It is shown that substantial conflict exists regarding the relative roles of primary and secondary alpha, beta grain size, morphology of the phases, and chemistry in controlling crack growth in these materials. These conflicts may be explained by the sensitivity of the material microstructure and texture to thermomechanical processing and microchemical variations. Author

N74-32962# Galvanizers Association of Australia, Melbourne.

GALVANIZING MANUAL AND DIRECTORY

May 1974 290 p
(ISBN-0-9500906-1-1) Avail: NTIS HC $17.50

A guide for coating steel products with zinc to prevent corrosion is presented. Galvanizing processes described include: hot dip galvanizing, design specification and inspection of galvanized products, bolting zinc coated steel, welding zinc coated steel, soft soldering zinc coated steel, and painting zinc coated steel. A directory of galvanizers in Australia and New Zealand is included. F.O.S.

N74-32963*# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.

HYDROGEN ADSORPTION AND DIFFUSION, AND SUBCRITICAL-CRACK GROWTH IN HIGH-STRENGTH STEELS AND NICKEL BASE ALLOYS Final Report, 1 Nov. 1971 - 31 May 1974

R. P. Wei, K. Klier, and G. W. Simmons Jun. 1974 158 p refs
(Grant NGR-39-007-067)
(NASA-CR-140008; IFSM-74-63) Avail: NTIS HC$11.00 CSCL 11F

Coordinated studies of the kinetics of crack growth and of hydrogen adsorption and diffusion were initiated to develop information that is needed for a clearer determination of the rate controlling process and possible mechanism for hydrogen enhanced crack growth, and for estimating behavior over a range of temperatures and pressures. Inconel 718 alloy and 18Ni(200) maraging steel were selected for these studies. 18Ni(250) maraging steel, 316 stainless steel, and iron single crystal of (111) orientation were also included in the chemistry studies. Crack growth data on 18Ni(250) maraging steel from another program are included for comparison. No sustained-load crack growth was observed for the Inconel 718 alloy in gaseous hydrogen. Gaseous hydrogen assisted crack growth in the 18Ni maraging steels were characterized by K-independent (Stage 2) extension over a wide range of hydrogen pressures (86 to 2000 torr or 12 kN/m2 to 266 kN/m2) and test temperatures (-60 C to +100 C). The higher strength 18Ni(250) maraging steel was more susceptible than the lower strength 200 grade. A transition temperature was observed, above which crack growth rates became diminishingly small. Author

N74-32964*# Techtran Corp., Glen Burnie, Md.
POWDER METALLURGICAL PRODUCTION OF HIGH-TEMPERATURE-RESISTANT, DISPERSION-HARDENED, TEMPERABLE NICKEL-BASE ALLOYS
K. H. Kramer Washington NASA Sep. 1974 21 p refs Transl. into ENGLISH of the publ. "Pulvermetallurgische Herstellung Hochwarmfester, Dispersionsgehaerteter, Aushaertbarer Nickelbasislegierungen" Essen, Fried. Krupp G.m.b.H., Krupp Forschungsinstitut, 1973 27 p
(Contract NASw-2485)
(NASA-TT-F-15854) Avail: NTIS HC $4.25 CSCL 11F

The mixing and milling of elemental powders or pre-alloys together with dispersate in an agitator ball mill (Attritor) are examined. The pros and cons of dry and wet milling, and choice of dispersate are discussed. Charging coarse-grained intermetallic phases promotes milling to small dimensions; the fine-grained intermetallic phases promotes milling to small dimensions; the fine-grained powder absorbs less oxygen. Compaction of powders in an isostatic hot-press was optimum at 1200 C/1 hr/1000 bar. Microscopies showed good dispersate distribution. The fine-grained structure was superplastic at high temperatures. Author

N74-32965*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADHESION, FRICTION AND AUGER SPECTROSCOPY ANALYSIS OF A COMMERCIAL COBALT BASE AIRCRAFT TURBINE SHROUD ALLOY
Donald H. Buckley [1974] 14 p refs
(NASA-TM-X-71609; E-8092) Avail: NTIS HC $3.00 CSCL 11/6

A commercially used cast cobalt base alloy was investigated as a turbine shroud material which revealed a surface enriched with tungsten and carbon suggesting a surface layer of tungsten carbide. Adhesion and friction of this segregated surface layer are higher than for the bulk cobalt base alloy composition. Auger spectroscopy analysis of the segregation of tungsten in the alloy indicates that it occurs between 850 and 1000 C. Author

N74-32966# Oak Ridge National Lab., Tenn.
DEFORMATION AND MICRO-FRACTURE BEHAVIOR OF TWO-PHASE TUNGSTEN ALLOYS, LIQUID PHASE SINTERED
E. J. Votava [1974] 6 p refs Transl. into ENGLISH from Planseeber. Pulvermet. (Reutte/Tirol), v. 21, 1973 p 79-87
(ORNL-TR-2808) Avail: NTIS HC $4.00

The great ductility of W-Ni-Fe containing 80-94 wt% W and Ni/Fe ratio of 7:3, appears to be determined by the following factors: (1) formation of a ductile matrix and absence of a brittle WNi4 phase, which inhibits propagation of surface microcracks at the W grain boundaries and self-healing of internal microcracks; (2) hydrostatic pressure in the interior, which helps to prevent intercrystalline fracture at the W grain boundaries; (3) formation of highly ductile W single crystal grains, probably due to the very high purity of the material; and (4) good bond between the W grains and the matrix as a result of efficient wetting and prevention of formation of the brittle WINI4 phase due to the presence of Fe. Author (NSA)

N74-32967# Cornell Univ., Ithaca, N.Y.
DEFECTS IN METAL CRYSTALS Progress Report, 1 May 1973 - 30 Apr. 1974
R. W. Balluffi and D. N. Seidman 1974 22 p refs
(Contract AT(11-1)-3158)
(COO-3158-28) Avail: NTIS HC $4.25

Progress was made in the following areas: FIM (field ion microscopy) studies of defects in W irradiated with W ions or electrons; FIM studies of Au irradiated with Au or Xe ions; FIM and electrical resistivity study of vacancy defects in quenched W; FIM studies of dilute Pt alloys; measurement of the range of focused replacement sequences in Au; investigation of grain boundary structure (using Au); FIM observation of dissociated screw dislocations in Mo; calculation of properties of point defects in metals; and atom probe FIM. Author (NSA)

N74-32968# Ecole Nationale Superieure de Techniques Avancees, Paris (France). CL887166
CHARACTERISTICS OF TA6V ALLOY MICROSTRUCTURE AFTER THERMOMECHANICAL TREATMENT IN THE ALPHA PLUS BETA PHASE. EFFECTS ON MECHANICAL CHARACTERISTICS IN ELONGATION [CARACTERISTIQUES MICROSTRUCTURALES DE L'ALLIAGE TA6V, EN FONCTION DES TRAITEMENTS THERMOMECANIQUES EN ALPHA ET BETA INCIDENCES SUR LES CARACTERISTIQUES MECANIQUES EN TRACTION]
B. HadjSassi, A. Quivy, and P. Lehr 1973 30 p refs In FRENCH Prepared jointly with CNRS
(Rept-030) Avail: NTIS HC $4.50

The microstructural evolution of the Ta6V alloy after thermomechanical treatment in the alpha plus beta phase is discussed. The study is performed as a function of the annealing temperature. The parameters investigated are: residual cold drawing, recrystallization, and phase equilibrium processes competition during annealing. A correlation is proposed between the annealing temperature, the alloy structural morphology, and the tensile characteristics. ESRO

N74-32969# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
HYDROGEN EMBRITTLEMENT OF 4340 STEEL BY CADMIUM ELECTROPLATING Interim Report
R. J. H. Wanhill and P. deRijk Mar. 1973 37 p refs Sponsored by the Directorate of Mater., Air, RNLAF
(NLR-TR-73028-U; IR-1) Avail: NTIS HC $5.00

After heat treating, delayed failure specimens and hydrogen analysis samples were cadmium plated. The specimens and samples were subsequently baked for different times. In the absence of a baking treatment, notched delayed failure specimens were highly embrittled by both bright and porous cadmium plate. An 8 hr baking treatment was almost sufficient to remove embrittlement from both kinds of plated specimen. It is tentatively suggested that 4300 steel with an ultimate tensile strength of 183-197 kgf/sq mm (260-280 ksi) can be safely electroplated in a low embrittlement bath provided an adequate baking treatment is applied. Author (ESRO)

N74-32970# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
A STUDY OF SURFACE TREATMENT OF ALUMINUM ALLOY SAMPLES BY MEASURING LIGHT STIMULATED ELECTRON EMISSON AND CONTACT POTENTIAL
A. Hartman Jul. 1973 43 p refs Sponsored by the Neth. Agency for Aerospace Programs
(NLR-TR-73085-U) Avail: NTIS HC $5.25

Tests on aluminum alloy samples anodized in a tartrate solution indicated that porefree thin oxide films prevent almost all light stimulated electron emission. Probably pores are requisite for emission. The contact potential and emission as function of the pickling time in chromic-sulfuric acid solution could be explained qualitatively. The micro etch pit structure with excellent bonding to adhesives was not a dominant factor with respect to the emission of the sample. The post-treatment, rinsing and drying, had a significant effect on the photoemission of the surface. Author (ESRO)

N74-32971# Lehigh Univ., Bethlehem, Pa.
MEASUREMENT OF STRAIN RATE EFFECTS IN METALS

Final Report
Wesley R. Smith Apr. 1974 38 p refs
(Contract DAAD05-72-C-0406; DA Proj. 1T0-61102-A-33E)
(AD-780733; BRL-CR-150) Avail: NTIS CSCL 11/6

A new shock tube technique has demonstrated the existence of strain rate effects in the plastic deformation of metals. A transient deformation is produced in a thin-walled cylindrical metal tube loaded by a plane air shock wave propagating inside it. Surface strain gauges allow a direct measurement of the shock-produced transient strain. Preliminary experiments with annealed aluminum tubes have demonstrated the existence of strain relaxation when the shock-applied normal surface stress exceeds the static elastic limit. Strain relaxation data from these experiments was used with the quasi-static model developed to describe the deformation of the tube. The experimental and model strain-time profiles compared favorably. (Modified author abstract) GRA

N74-32972# Michigan Univ., Ann Arbor. Cavitation and Multiphase Flow Lab.
LIQUID INDUCED EROSION RESEARCH OF UNIVERSITY OF MICHIGAN CAVITATION AND MULTIPHASE FLOW LABORATORY
F. G. Hammitt, G. C. Ernst Linhdo, F. G. Hammitt, Jr., and Y. C. Huang Mar. 1974 31 p refs Presented at the 3d Conf., on Steam Turbines IMP PAA, Gdansk, Poland, Sep. 1974
(Grant NSF GK-40130)
(PB-231150/4; UMICH-012449-2-T) Avail: NTIS HC $4.75 CSCL 11F

Erosion results upon metallic materials are reported for a water-jet gun device showing the dependence of erosion rate upon velocity. It is shown that for this particular device there is a velocity corresponding to maximum erosion rate, presumably because of the change in jet leading-edge shape as a function of velocity. Effects of angle of impact for the same device are also shown, indicating a stronger fall-off with decrease of angle than is normally supposed. High-speed motion picture sequences of the impact phenomenon with various non-metallic materials are presented, showing details of splash-back patterns observed. Preliminary photographic observations of the fragmentation and build-up of liquid films on turbine blade profiles in low-pressure wet steam flows are presented. (Modified author abstract) GRA

N74-32973# Army Construction Engineering Research Lab., Champaign, Ill.
A NEW LOOK AT STRUCTURAL ENERGY DISSIPATION Final Report
F. B. Plummer, Jr. May 1974 62 p refs
(DA Proj. 4A0-61102-B-52E)
(AD-780801; CERL-TM-M-82) Avail: NTIS CSCL 11/6

The investigation is the first step of a continuing study on energy dissipation in large, dynamically loaded structures. Work is directed at qualitatively and quantitatively defining the dissipative properties of complex structural systems, with a view toward improving the considerations of energy dissipation and nonlinear response in the seismic analysis and design of buildings. The present study deals with the extension of finite element methods to provide an analytical means for determining energy dissipation caused by cyclic plasticity in cyclically loaded structures. A computer-based cyclic stress-strain simulation model is developed which serves as the basis for the finite element constitutive relation. The model's behavior incorporates hysteretic material behavior and load history effects. It is experimentally verified for A-36 steel. (Modified author abstract) GRA

N74-32974# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
DEFORMATION AND SOLID SOLUTION STRENGTHENING OF BCC TITANIUM-MOLYBDENUM ALLOYS Annual Report, 1 Jan. - 1 Jun. 1974
R. G. Baggerly, N. E. Paton, and J. C. Williams Jun. 1974 40 p refs
(Contract N00014-71-C-0363; NR Proj. 031-752)
(AD-780911; SC518.22AR) Avail: NTIS CSCL 11/6

The deformation and strengthening of bcc Ti-Mo alloys has been investigated by examining single crystals of Ti-12-1/2 wt.% Mo. A change in deformation mode from twinning to slip occurs when single phase crystals are aged to precipitate omega phase. In the single phase solution treated condition, the crystals deform by (332) -113= twinning. When omega phase is present the crystals deform by -111= slip. The occurrence and formation of alpha phase in Ti-Mo-Al alloys has also been investigated. The relationship between Burgers and non-Burgers alpha phase is discussed with regard to mechanisms of formation and kinetics of the transformation. Author (GRA)

N74-32975# Terra Tek, Inc., Salt Lake City, Utah.
THE MECHANICAL RESPONSE OF A POROUS URANIUM ALLOY Final Report, Dec. 1972 - Jul. 1973
F. H. Shipman, J. N. Johnson, and S. J. Green Apr. 1974 54 p refs
(Contract DAAG46-73-C-0094; DA Proj. 1W1-62112-A-661)
(AD-780915; TR-73-36; AMMRC-CTR-74-34) Avail: NTIS CSCL 11/6

Experimental and theoretical results are presented for the mechanical response of a porous uranium alloy subject to quasistatic uniaxial strain and hydrostatic compression. Two states of porosity were studied; one very small (about 1%) and the other somewhat larger (about 13%). Experimental techniques previously employed on geological materials are used to obtain all principal stress and strain components. Also, longitudinal elastic wave speeds obtained by ultrasonic techniques are presented as a function of initial sample density. The stress-strain behavior of this material is porosity dependent and no distinct elastic limit or crushup strength is observed. An analytical model that considers both the mean normal stress and the deviatoric stress influence on the crushup process is developed for uniaxial-strain and hydrostatic loading conditions. (Modified author abstract) GRA

N74-32976# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AN ALLOY OF THE Nb-Ta-Ti SYSTEM FOR WORKING IN HIGHLY AGRESSIVE CHEMICAL MEDIA
I. Ya Georgieva and A. P. Gulyaev 18 Jun. 1974 9 p refs Transl. into ENGLISH from Tr. Inst. Khimicheskogo Mashinostroeniya (USSR), no. 38, 1971 p 46-49
(AD-781173; FTD-HT-23-1533-74) Avail: NTIS CSCL 11/6

A Nb (20 at. %)-Ta (7 at. %)-Ti alloy was prepared. This alloy was easily rolled by cold rolling into a sheet without intermediate annealings. The results of corrosion tests on the ternary alloy and on pure niobium and tantalum in boiling hydrochloric, sulfuric and phosphoric acids are given. GRA

N74-32977# Army Foreign Science and Technology Center, Charlottesville, Va.
INTERMETALS AND CONSTRUCTION MATERIALS BASED ON THEM
L. Ya. Popilov 7 Oct. 1972 9 p refs Transl. into ENGLISH from the book "Novye Materialy v Sudostroenie" Leningrad, 1966 p 443-535
(AD-781248; FSTC-HT-23-2309-72) Avail: NTIS CSCL 11/6

Alloys such as titanium, veryllium and silicon, with nickel, carbon and bismuth have new properties of great importance for the construction industry. Their fire-resistant properties are outstanding. Tables list the most important properties of several beryllides and of titanium-nickel alloys. GRA

N74-32978# Denver Research Inst., Colo.
RESPONSE OF NICKEL-BASE SUPERALLOYS TO THERMO-MECHANICAL PROCESSING BY SHOCK-WAVE DEFORMATION Final Technical Report, 6 Dec. 1973 - 5 Apr. 1974
R. Norman Orava Apr. 1974 104 p refs
(Contract N62269-73-C-0376)
(AD-781726; DRI-2638) Avail: NTIS CSCL 11/6

An investigation was conducted to study the synergistic effects of thermal treatment and explosive shock loading on the microstructure and mechanical properties of Udimet 700 and Inconel 718. The influence of such shock thermomechanical processing (TMP) is compared with that of thermal processing alone, and with that of conventional TMP by cold rolling to an effective strain equivalent to the transient shock strain. The applied peak shock pressures were 527 kbar for Udimet 700, and 510 kbar for Inconel 718, with a 1-microsec duration, and the equivalent thickness reduction by rolling was 19.1% for both materials. In general, it was found that the most favorable TMP schedules are those which involve a partial aging treatment prior

to cold working. The shock TMP of Udimet 700 and Inconel 718 resulted in improvements in room and elevated temperature strengths, elevated temperature ductility and toughness in the minimum ductility region, stress-rupture life, and low-cycle fatigue life. (Modified author abstract) GRA

N74-32979# Mechanical Technology, Inc., Latham, N.Y.
INDUCTIVE FATIGUE DETECTOR: FIELD SYSTEM DEVELOPMENT Final Report
Leo Hoogenboom, Richard Dorman, and George Moross Apr. 1974 32 p refs
(Contract DAAJ02-72-C-0034; DA Proj. 1F1-62203-A434)
(AD-781593; MTI-73TR35; USAAMRDL-TR-73-67) Avail: NTIS CSCL 14/2

The report describes the hardware development of a rotating inductive flaw detector, based on an experimental unit built under a previous phase of the program. A complete self-contained transducer and readout unit for field use on aluminum is described and documented. Included are results of design experiments, manufacturing drawings, and tests of standard fatigue specimens. Author (GRA)

N74-33400* General Electric Co., Philadelphia, Pa.
LEVITATION HEATING AND MELTING OF TUNGSTEN, APPENDIX A
Gerald Wouch *In its* Study for Identification of Beneficial Uses of Space (BUS), Phase 2, Vol. 2, Book 2, Sect. 5 1 Nov. 1973 24 p refs (For availability see N74-33399 22-34)
CSCL 11F

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N74-32980 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
FABRICATION OF COMPOSITE MATERIALS FOR USE AT HIGH TEMPERATURES WITH POLYQUINAZOLINE MATRIX Final Report [ETUDE DE LA FABRICATION DE MATERIAUX COMPOSITES UTILISABLES A TEMPERATURE ELEVEE, A MATRICE DE POLYQUINAZOLINE]
B. Bloch, J. P. Favre, J. C. Mondet (Soc. Natl. des Poudres et Explosifs), and B. Dumas (Soc. Natl. des Poudres et Explosifs) Dec. 1973 58 p refs In FRENCH
(Contract DGRST-72-7-0820)
Avail: Issuing Activity

The new heterocyclic polyquinazoline resins are stable up to 400 C and their structural applications derive from their good mechanical properties related to high molecular masses. The synthesis of the resin derived from polydiphenyl etherisophtalamide and benzonitril was performed with regard to industrial application and economics. The use of this resin as a matrix for carbon-boron and glass-fiber composites was facilitated by its solubility and thermoplasticity. It was shown that it is possible to produce dense laminates with high mechanical resistance up to the melting point at 250 C. Fire resistance is also excellent. Tests were performed to produce thermohardening polyquinozolines that could be used over the whole range of thermal stability. ESRO

N74-32981 Institut Francais du Caoutchouc, Le Mans. Lab. de Chimie Macromoleculaire.
COMPOSITE MATERIAL REINFORCEMENT BY THIN METALLIC ELEMENTS Final Report [RENFORCEMENT DES COMPOSITES PAR DES ELEMENTS METALLIQUES PLATS TRES MINCES]
R. Pautrat Jul. 1973 19 p In FRENCH
(Contract DGRST-71-7-2999)
Avail: Issuing Activity

The reinforcement of thermosetting polymers by thin metallic sheets is presented. Metallic sheets with Ni, Cr, Co bases were used. The surface treatment of the metallic pieces is detailed. The resin synthesis is discussed with regard to polyepoxides, polyimides, and polybenzothiazols. The mechanical properties of test pieces are reported in regard to problems encountered. Elastomeric materials reinforcement by thin metallic sheets of ordinary cold-drawn steel was attempted. The preparation of composite ruber-metal is discussed with regard to mechanical properties and possible applications. ESRO

N74-32982 Institut Textile de France, Boulogne- Billancourt.
COMPOSITE MATERIALS. PROPERTIES OF THE ASSOCIATION FIBER-BONDING AGENT Final Report [MATERIAUX COMPOSITES. ETUDE DES PROPRIETES DE L'ASSOCIATION FIBRE-LIANT]
Jean Jacquemart and Bernard Leclercq 30 Jun. 1973 36 p In FRENCH
(Contract DGRST-72-7-0201)
Avail: Issuing Activity

The action of electric discharge on wool as a pre-treatment for improved resin adhesivity is presented. It is shown that electric discharges do not alter the mechanical properties of wool. The underlying mechanism for this effect was found to be the consequence of cysteine oxidation into cisteic acid. The reaction is localized at cuticle level. Application to fabrics was performed and results are given in tabular and graphical form. ESRO

N74-32983 Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
POLYMERS FOR OPTICAL WAVEGUIDES USING ELECTRONIC MASKING Final Report [ETUDE DE POLYMERES POUR REALISATION DE GUIDES DE LUMIERE PAR MASQUAGE ELECTRONIQUE]
M. Gazard and J. C. Dubois Sep. 1973 46 p refs In FRENCH
(Contract DGRST-72-7-0557)
Avail: Issuing Activity

The electronegative resin polyvinylsiloxane with low refractive index was shown to be inadequate for optical waveguides even on low index substrates such as fluorine as there is insufficient adhesivity. It may however, be used as masking agent for ion machining although results are not reproducible. Polyphenylsiloxane gave good results. Its high refractive index permits good propagation of energy in thin films, one micron thick, deposited on silica. The synthesis of various polyphenylsiloxanes differing in their molecular weight was performed; after electronization they become insoluble in benzene. The best sensitivity was obtained for a molecular weight of 1.3 million. Other silicone resins, copolymers of vinylsiloxane, phenylsiloxane, and polydichlorophenyl siloxane were tested with no interesting results. ESRO

N74-32984*# General Dynamics/Convair, San Diego, Calif.
DEVELOPMENT OF DESIGN DATA FOR GRAPHITE REINFORCED EPOXY AND POLYIMIDE COMPOSITES Final Report
W. G. Scheck May 1974 457 p refs
(Contract NAS8-26198)
(NASA-CR-120413; GDC-DBG70-005) Avail: NTIS HC $26.00 CSCL 11D

Processing techniques and design data were characterized for a graphite/epoxy composite system that is useful from 75 K to 450 K, and a graphite/polyimide composite system that is useful from 75 K to 589 K. The Monsanto 710 polyimide resin was selected as the resin to be characterized and used with the graphite fiber reinforcement. Material was purchased using the prepreg specification for the design data generation for both the HT-S/710 and HM-S/710 graphite/polyimide composite system. Lamina and laminate properties were determined at 75 K, 297 K, and 589 K. The test results obtained on the skin-stringer components proved that graphite/polyimide composites can be reliably designed and analyzed much like graphite/epoxy composites. The design data generated in the program includes the standard static mechanical properties, biaxial strain data, creep, fatigue, aging, and thick laminate data. Author

N74-32985# Aeronautical Research Labs., Melbourne (Australia).
THE STRUCTURE AND MECHANICAL PROPERTIES OF CARBON FIBRES

R. A. Coyle and B. J. Wicks Jan. 1974 28 p refs
(ARL/Met-Note-98) Avail: NTIS HC $4.50

The mechanical properties of carbon fibers are discussed. The performance of carbon fiber composite materials, the basic fiber structure, and the size and distribution of stress-raising flaws are examined. The extent to which structural parameters are affected by graphitizing heat treatments is analyzed and the role of these parameters in limiting the potential performance of carbon fibers is indicated. Various processing treatments which have been found to modify the final fiber characteristics are surveyed and the structural changes underlying these treatments are defined. Author

N74-32986# Aeronautical Research Labs., Melbourne (Australia).
X-RAY STRESS MEASUREMENTS ON THE FIBRES OF LOADED MODEL COMPOSITES
G. A. Hawkes Feb. 1974 16 p refs
(ARL/Met-Note-99) Avail: NTIS HC $4.00

An X-ray technique was used to determine the stresses in the fibers of loaded model composites of platinum-rhodium wire in Araldite. The experimental stress determinations were compared with theoretical predictions and were also used to study variations in the value of the matrix strain which is taken as a constant in the Cox theoretical analysis. The possibilities are discussed of using the X-ray technique for the nondestructive determination of composite properties such as maximum effective interfacial shear stress, magnitude of end effect, and the stress transfer length. Author

N74-32987*# Rensselaer Research Corp., Troy, N.Y. Tribology Lab.
DEVELOPMENT OF AIRCRAFT BRAKE MATERIALS
Ting-Long Ho and Marshall B. Peterson Mar. 1974 78 p refs
(Grant NGR-33-018-152)
(NASA-CR-134663) Avail: NTIS HC $7.00 CSCL 11D

The requirements of brake materials were outlined and a survey made to select materials to meet the needs of high temperature brakes. A number of metals and ceramic materials were selected and evaluated in sliding tests which simulated aircraft braking. Nickel, molybdenum tungsten, Zr02, high temperature cements and carbons were tested. Additives were then incorporated into these materials to optimize their wear or strength behavior with particular emphasis on nickel and molybdenum base materials and a high temperature potassium silicate cement. Optimum materials were developed which improved wear behavior over conventional brake materials in the simulated test. The best materials are a nickel, aluminum oxide, lead tungstate composition containing graphite or molybdenum disulphite; a molybdenum base material containing LPA100 (an intermetallic compound of cobalt, molybdenum, and silicon); and a carbon material (P5). Author

N74-32988*# Babcock and Wilcox Co., Augusta, Ga. Refractories Div.
DEVELOPMENT OF FINE DIAMETER MULLITE FIBER
W. G. Long 20 Feb. 1974 85 p refs
(Contract NAS3-16764)
(NASA-CR-134612; LRC-5467) Avail: NTIS HC $7.25 CSCL 11D

Results are presented of a program to develop and evaluate mullite fiber with a mean diameter under two microns. The two micron fiber is produced by a blowing process at room temperature from a low viscosity (10-25 poise) solution. The blown fiber was evaluated for dimensional stability in thermal cycling to 1371 C, and was equivalent to the 5 micron spun B and W mullite fiber. An additive study was conducted to evaluate substitutes for the boron. Three levels of chromium, lithium fluoride, and magnesium were added to the standard composition in place of boron and the fiber produced was evaluated for chemical and dimensional stability in thermal cycling to 1371 C. The magnesium was the most chemically stable, but the chrome additive imparted the best dimensional stability. Author

N74-32989*# Techtran Corp., Glen Burnie, Md.
STRENGTH BEHAVIOR OF ADHESIVE BONDS UNDER IMPACT LOADS
C. Hahn Washington NASA Sep. 1974 16 p refs Transl. into ENGLISH from VDI (Ver. Deut. Ing.) Z. (West Germany), v. 116, no. 4, Mar. 1974 p 311-316
(Contract NASw-2485)
(NASA-TT-F-15869) Avail: NTIS HC $4.00 CSCL 11A

An optical electric assembly with a photodiode, a hammer, and a pendulum ram testing device was used in determining the impact strength of several commercial adhesive bonding materials applied to metals. It was found that bonding performance under impact stresses was better in adhesive materials with a greater deformation margin than in those with lower elastoplastic characteristics. Author

N74-32990# Royal Aircraft Establishment, Farnborough (England).
THERMAL DEGRADATION AND STABILIZATION OF EPICHLOROHYDRIN RUBBERS
M. Yamada, S. Arai, and Y. Masuda Apr. 1974 17 p refs Transl. into ENGLISH from Nippon Gomu Kyokaishi (Tokyo), v. 46, no. 5, 1973 p 404-411
(RAE-Lib-Trans-1755; BR41553) Avail: NTIS HC $4.00

The chemical stress relaxation and the amount of hydrogen chloride evolved during the thermal degradation of epichlorohydrin rubbers were measured and some deductions were made concerning the mechanism of degradation. The degradation of epichlorohydrin rubbers was found to proceed in two steps. Initial degradation was apparently due to ordinary auto-oxidation, while the following degradation is by hydrogen chloride formed by oxidation. The second step is accompanied by softening. It was found that polyhydroxy aromatic acids such as gallic acid have a stabilizing effect. Author

N74-32991# Royal Aircraft Establishment, Farnborough (England).
THE EFFECT OF THE COMPOSITION OF GASEOUS MEDIA ON THE FRICTION OF GRAPHITIC MATERIALS
L. Plutalova May 1974 12 p refs Transl. into ENGLISH from Russian Rept. Presented at 4th Sci. and Tech. Conf. on Probl. of Increasing the Durability and Life of Machines, Kiev, 1966
(RAE-Lib-Trans-1761; BR41709) Avail: NTIS HC $4.00

The friction and wear properties of a graphitic carbon sliding against steel have been measured in vacuum and in air, oxygen, nitrogen, argon, and helium. The influence of water vapor in helium was studied. In dried gases, high friction and wear dusting were obtained only when the nominal surface pressure exceeds a critical value. Below this value, the friction and wear remain low, even in a vacuum at high temperatures. It is concluded that mechanical factors are more important than adsorption phenomena in the transition to dusting. Author

N74-32992# Illinois Inst. of Tech., Chicago.
STRENGTHENING AND TOUGHENING OF BRITTLE MATERIALS Progress Report, 31 Jan. 1973 - 31 Jan. 1974
L. J. Broutman and P. K. Mallick 1974 202 p refs
(Contract AT(11-1)-1974)
(COO-1794-18) Avail: NTIS HC $12.25

Studies were conducted on spherical particle and fibrous composites. The six reprints deal with: three-dimensional finite-element analysis, effects of interface on mechanical properties of low aspect ratio fiber composites, reinforcement of epoxy resins with potassium titanate whiskers, mechanical properties of glass bead-filled epoxy composites, and interfacial layer effects on properties of composites. Author

N74-32993# Ecole Nationale Superieure de Techniques Avancees, Paris (France). Groupe Commun de Recherche en Mecanique des Materiaux Composites.
ON VARIATIONAL THEOREMS FOR LAMINATED ELASTIC PLATES
G. Verchery 1973 23 p refs In FRENCH; ENGLISH summary Prepared jointly with Ecole Natl. Super. des Mines
(Rept-031) Avail: NTIS HC $4.25

Variational principles are given as a basis for numerical analysis methods for elastic laminate coupled plates. From the equation of virtual work per unit, surface formula for forces, couples, displacement, and rotation at the boundary are derived. Three new thermodynamical potentials are introduced by means

of Legendre transformations of free energy density. They are expressed as functions of: forces and curvatures; strains and moments; and forces and moments. Equations and interrelations are given for the linear case. The boundary condition and the definition of admissible virtual fields are detailed. The free energy and Gibbs potential for the whole plate are given. For each of the potentials , variational theorems are given, and the principle of demonstration is outlined. The stationary values of the four functionals are equal, but the nature of these points is different. The variational theorems valid as a consequence of local equilibrium are shown to be related to the stability principle of thermodynamical equilibrium of systems. ESRO

N74-32994# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium).
CONCRETE-STEEL COMPOSITE STRUCTURES. REDUCTION IN NUMBER OF CONNECTING PINS BY RETICULATED SOLE AT CONCRETE-STEEL INTERFACE [CONSTRUCTIONS MIXTES ACIER-BETON. DIMINUTION DU NOMBRE DE CONNECTEURS PAR L'EMPLOI D'UNE SEMELLE DE CONTACT ACIER-BETON A ADHERENCE RENFORCEE]
Jose Janss and Jean-claude Lambert Apr. 1974 39 p refs In FRENCH Sponsored by Inst. pour l'Encour. de la Rech. Sci. dans l'Ind. et l'Agr.
(CRIF-MT-88) Avail: NTIS HC $5.00

The number of connecting pins that are used to link steel to concrete in composite beams is shown to be reduced dramatically by the use of contact soles in corrugated steel. Static and dynamic tests of the push out type were carried out on beams of reduced dimensions. The artificial adherence created by this technique makes possible a 50% reduction in the number of required pins. ESRO

N74-32995# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Section Construction Metallique.
CALCULATION OF LOAD TO DESTRUCTION FOR CONCRETE IMBEDDED METALLIC COLUMNS [LE CALC UL DES CHARGES ULTIMES DES COLONNES METALLIQUES ENROBEES DE BETON]
Robert Anslijn and Jose Janss Apr. 1974 81 p refs In FRENCH Sponsored by Inst. pour l'Encour. de la Rech. Sci. dans l'Ind. et l'Agr.
(CRIF-MT-89) Avail: NTIS HC $7.25

The calculation of load to failure for metallic columns wrapped with concrete is shown to lead to realistic results when use is made of the buckling curves for steels. The methods used allow for calculation of load to failure whatever the steel shade and the concrete quality, the type of beams used, or the load distribution. There is good agreement between theory and experiment. Simple noneograms, generated by computer, allow for quick determination of critical loads for common profiles, such as IPE, HEA, HEB, with elasticity modules between 2400 to 3000 kg/sq cm with a concrete wrapping of quality between 3C0 to 500 kg/sq cm in compression resistance measured on a cube. ESRO

N74-32996# Defence Research Information Centre, Orpington (England).
THE WEATHERING OF PLASTICS MATERIALS IN THE TROPICS. 1: POLYCARBONATE
1973 31 p
(BR37168; S/T-Memo-13-73) Avail: NTIS HC $4.75

A single injection-moulding grade of unstabilized polycarbonate was exposed to outdoor weathering for periods of up to four years, on two tropical sites in Australia and one temperature site in the UK. Dimensional and visual changes and certain mechanical and electrical properties were monitored in order to follow changes due to weathering. Outdoor weathering resulted in the development of a yellow color and dulling of the original surface gloss, particularly under hot/wet conditions. A temperature exposure of two years seems to produce no other effect which could definitely be associated with weathering. Tropical exposure led to a drastic fall in elongation at break within six months, a change not reflected in any of the other properties measured. Undoubtedly long exposure leads to embrittlement, particularly evident after two years at the hot/wet site, but results with some four year control sepcimens show that even this change could be, in part, an aging as distinct from a weathering phenomenon. Molecular weight measurements showed that UV oxidation during weathering causes a reduction in molecular weight, ie chain scission is the dominant degradative process. There were indications that some crosslinking also occurred.
Author (ESRO)

N74-32997# Posterijen, Telegrafie en Telefonie, The Hague (Netherlands). Dr. Neher Lab.
JOINING PLASTICS [LIJMEN VAN PLASTICS]
P. Klapwijk [1973] 13 p In DUTCH
(CHL-288) Avail: NTIS HC $4.00

Tables showing the adhesives to be used for joining plastics to plastics and plastics to other materials are presented. A list of the adhesives and their tradenames are given. Plastics is classified, and their solubility in various solvents is indicated.
ESRO

N74-32998# Army Foreign Science and Technology Center, Charlottesville, Va.
HANDBOOK OF SOVIET ADHESIVES
Howard Jaffe, Gus G. Orpanides, and Arthur F. Readdy, Jr. Apr. 1974 245 p refs
(FSTC Proj. 4201116SH)
(AD-780713; FSTC-HB-01-100-74) Avail: NTIS CSCL 11/1

The report presents a narrative analysis of Soviet conventional and high-performance adhesive and tabular data on the properties, compositions, designations, and characteristics of the adhesive material. It presents potential or known uses of the adhesives, including glue welding technology. Comparative analysis of U.S. and U.S.S.R. adhesives programs is presented in a tabular form. A tabulation of major institutes and key personnel conducting adhesives research is presented. Author (GRA)

N74-32999# Whittaker Corp., San Diego, Calif. Research and Development Div.
ANALYTICAL PARAMETRIC STUDY OF LOW VELOCITY ON IMPACT ON HIGH MODULUS, ORTHOTROPIC COMPOSITE STRUCTURES Final Report, Jan. - Jun. 1974
Kenneth R. Berg Jun. 1974 69 p
(Contract DAAA21-74-C-0246)
(AD-780701; WRD-SDE-74-61) Avail: NTIS CSCL 11/4

An analytical parametric study of low velocity impact on orthotropic plates and tubes was conducted. Relationships were established between the dynamic structural deflection and the impact parameters such as impactor mass, velocity, height of drop, energy level, etc. The severity of the loading on the structure was determined relative to the impact parameters and the natural frequency (first mode) of the structure. Author (GRA)

N74-33000# Navy Clothing and Textile Research Unit, Natick, Mass.
FLAME-RETARDANT CLOTHING AND TEXTILE ITEMS FOR USE IN OXYGENENRICHED ENVIRONMENTS OF DECOMPRESSION CHAMBERS
George S. Higginbottom and John Silvia, Jr. Jun. 1974 29 p refs
(AD-779886; TR-110) Avail: NTIS CSCL 11/5

The Navy Clothing and Textile Research Unit (NCTRU) has developed clothing and textile items for use in the fire-hazardous, oxygen-enriched atmospheres of divers' decompression chambers. Small-scale laboratory tests on the flame retardancy of materials in oxygen-enriched environments led to the selection of candidate materials offering a potential for use. Full-scale flammability tests were performed on items made from materials selected for further study. Analyses of all test results led to the selection of Durette (modified Nomex) fabrics as offering the best compromise choice of materials for use in end-item constructions. Clothing and textile items were manufactured and forwarded to selected Navy decompression-chamber sites, which are using them on a permanent basis. Information based upon a limited use has shown the items to be acceptable in terms of design, performance and durability. Static generation on Durette materials, reported by some activities, can be effectively controlled by the use of anti-stat softeners during the laundry cycle. (Modified author abstract) GRA

N74-33001# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF OXIDES ON CERTAIN PROPERTIES OF GLASS CERAMIC COATINGS FOR TITANIUM
A. Ya. Sitnikova, V. A. Borisenko, I. A. Sudomoikin, A. G. Shaitan, and T. E. Kukulevskaya 19 Jun. 1974 17 p refs Transl. into ENGLISH from Tr. Vses. Soveshch. po Zharostoikim po Krytiyam (USSR), 1972 p 189-199
(AD-781660; FTD-23-1305-74) Avail: NTIS CSCL 11/2

The purpose of the work was to study the formability on titanium of coatings containing from 2 to 50% of one of the following oxides: SiO2, Al2O3, ZrO2, TiO2, Cr2O3, MgO, CeO2, ZrSiO4 and to study such properties of glass ceramic coatings as the coefficient of thermal expansion, impact resistance, chemical stability, heat resistance, and electrical resistance.
GRA

N74-33002# Texas A&M Univ., College Station. Mechanics and Materials Research Center.
ON THE MECHANICAL CONSTITUTION OF DAMAGEABLE MATERIALS
G. S. Brockway and G. D. Allen May 1974 42 p refs
(Contract N00014-68-A-0308-0003; NR Proj. 064-520)
(AD-781318; MM-2764-74-3; TR-3) Avail: NTIS CSCL 20/11

In the investigation, the elements of a mechanical constitutive theory for materials subjected to accumulated local damage, such as that resulting from the growth of small flaws, are laid down within the framework of Noll's theory of simple materials. A macroscopic definition of deformation--induced damage in a material with memory undergoing a motion having finite deformation gradients having first been given, the question of quantifying the damage done by a particular strain history is addressed. It is found that there are constitutive functionals for which the damage cannot be meaningfully measured without a knowledge of the subsequent deformation. The remainder of the paper is devoted to a consideration of a class of damageable materials (termed simple) for which the accrued damage can be measured solely in terms of the history of strain. A suitably modified fading memory postulate on the stress-functionals of such materials is introduced and its consequences explored. The significance of these theoretical notions is illustrated through a number of examples pertinent to the behavior of composite materials. Author (GRA)

N74-33003# Perkin-Elmer Corp., Norwalk, Conn. Electro-Optical Div.
LOW ABSORPTANCE METALLIC COATINGS FOR METALLIC SUBSTRATES Final Report, 28 Jun. 1972 - 15 Jan. 1974
John R. Kurdock Jun. 1974 80 p refs
(Contract F29650-72-C-0148; AF Proj. 3326)
(AD-781790; AFWL-TR-74-28) Avail: NTIS CSCL 11/3

The program resulted in producing the fabrication technology that is required for high-energy 10.6 micrometer laser programs now underway. Polishing and coating techniques for metallic substrates were developed and the deposition of metallic coatings to reproducibly create metal mirror surfaces with low absorptance of a wavelength of 10.6 micrometer was investigated. The basic task was one of expanding and transferring to metal substrates the technology developed by Bennett and Ashley for fused silica substrates. Metal substrates of molybdenum, TZM, and beryllium-copper were polished to a surface roughness of from 12 A to 15 A rms and overcoated with ultra-high-vacuum silver and gold. Absorption coefficients obtained were as low as 0.0064. The basic finishing technique that is now employed is acid etch stress relieving and controlled grinding, modified conventional polishing techniques, sputtering of similar metallic film, and modified conventional polishing. (Modified author abstract)
GRA

N74-33086 Israel Program for Scientific Translations, Ltd., Jerusalem.
STUDY OF THE RESISTANCE OF FIBROUS FILTERING MATERIALS IN RAREFIED AIR
I. V. Petryanov, B. I. Ogorodnikov, and L. A. Zimina *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 353-357 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N74-33004*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PARALLEL TRIDIAGONAL EQUATION SOLVERS
Harold S. Stone Apr. 1974 42 p refs Prepared in cooperation with Stanford Univ., Calif.
(NASA-TM-X-62370) Avail: NTIS HC $3.25 CSCL 12A

Three parallel algorithms were compared for the direct solution of tridiagonal linear systems of equations. The algorithms are suitable for computers such as ILLIAC 4 and CDC STAR. For array computers similar to ILLIAC 4, cyclic odd-even reduction has the least operation count for highly structured sets of equations, and recursive doubling has the least count for relatively unstructured sets of equations. Since the difference in operation counts for these two algorithms is not substantial, their relative running times may be more related to overhead operations, which are not measured in this paper. The third algorithm, based on Buneman's Poisson solver, has more arithmetic operations than the others, and appears to be the least favorable. For pipeline computers similar to CDC STAR, cyclic odd-even reduction appears to be the most preferable algorithm for all cases. Author

N74-33005*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE SOLUTION OF LARGE MULTI-DIMENSIONAL POISSON PROBLEMS
Harold S. Stone May 1974 30 p refs Prepared in cooperation with Stanford Univ., Calif.
(NASA-TM-X-62371; SU-SEL-TR-85) Avail: NTIS HC $3.25 CSCL 12A

The Buneman algorithm for solving Poisson problems can be adapted to solve large Poisson problems on computers with a rotating drum memory so that the computation is done with very little time lost due to rotational latency of the drum.
Author

N74-33006# Rice Univ., Houston, Tex.
A DIRECT METHOD FOR THE GENERAL SOLUTION OF A SYSTEM OF LINEAR EQUATIONS
H. Y. Huang 1974 32 p refs
(Grant NSF GP-41158)
(AAR-119) Avail: NTIS HC $4.75

A computationally stable method for the general solution of a system of linear equations is given. The system is A(T)x-B = 0, where the n-vector x is unknown and the n x q matrix A and the q-vector B are known. It is assumed that the matrix A(T) and the augmented matrix (A(T),B) are of the same rank m, where m < or = n, so that the system is consistent and solvable. When m < n, the method yields the minimum modulus solution x sub m and a symmetric n x n matrix H sub m of rank n-m, so that x = x sub m + H sub m y satisfies the system for all y, an n-vector. When m = n, the matrix H sub m reduces to zero and x sub m becomes the unique solution of the system. The method is also suitable for the solution of a determined system of n linear equations. When the n x n coefficient matrix is ill-conditioned, the method can produce a good solution, while the commonly used elimination method fails. Author

N74-33007# Eidgenossische Technische Hochschule, Zurich (Switzerland).
A JACOBI PROCEDURE FOR NORMAL MATRICES Ph.D. Thesis
Anton Kuehne 1974 96 p refs In GERMAN
Avail: NTIS HC $8.00

The eigenvalue problem of a normal matrix is considered for the case where the diagonalization by unitary transforma-

tions is achieved with the help of the Jacobi method. Complex Jacobi routines are described for each transformation of the Euclidic matrix to minimize outer diagonal elements.
Transl. by G.G.

N74-33008*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ROBUST DESIGN OF DYNAMIC OBSERVERS
S. P. Bhattacharyya Jul. 1974 28 p refs
(NASA-TM-X-64874) Avail: NTIS HC $3.25 CSCL 12A

The two (identity) observer realizations z = Mz + Ky and z = transpose of Az + transpose of K(y - transpose of Cz), respectively called the open loop and closed loop realizations, for the linear system x = Ax, y = Cx are analyzed with respect to the requirement of robustness; i.e., the requirement that the observer continue to regulate the error x - z satisfactorily despite small variations in the observer parameters from the projected design values. The results show that the open loop realization is never robust, that robustness requires a closed loop implementation, and that the closed loop realization is robust with respect to small perturbations in the gains transpose of K if and only if the observer can be built to contain an exact replica of the unstable and underdamped dynamics of the system being observed. These results clarify the stringent accuracy requirements on both models and hardware that must be met before an observer can be considered for use in a control system. Author

N74-33009*# Kanner (Leo) Associates, Redwood City, Calif.
PERIODIC SOLUTIONS TO A LIMITED PROBLEM OF THREE BODIES, INCLUDING A LARGE NUMBER OF REVOLUTIONS AROUND A SMALL BODY
I. V. Kurcheyeva and V. S. Novoselov, ed. Washington NASA Aug. 1974 11 p refs Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 168-172
(Contract NASw-2481)
(NASA-TT-F-15819) Avail: NTIS HC $4.00 CSCL 12A

To construct periodic solutions in a limited problem of three bodies, the Poincare small parameter method is used. A new system is given which is called generative, that admits periodic solutions. In fulfilling several conditions, one and only one periodic solution of the primary system will satisfy the periodic solution of the generative system. Author

N74-33010# Royal Aircraft Establishment, Farnborough (England).
ON INTENSITIES AND SUMMATION RULES IN NORMAL QUADRUPOLE MULTIPLETS
A. Rubinowicz Apr. 1974 23 p refs Transl. into ENGLISH from Z. Physik (West Ger.), v. 65, 1930 p 662-676
(RAE-Lib-Trans-1758; BR41688) Avail: NTIS HC $4.25

From a Laporte rule for quadrupole radiation it follows that dipole and quadrupole multiplets always appear separately. The relative transition probability in a normal quadrupole multiplet is determined and, with its help, the existence of summation rules for such multiplets is demonstrated. Author

N74-33011# Yale Univ., New Haven, Conn. Becton Center.
STABLE ADAPTIVE SCHEMES FOR SYSTEM IDENTIFICATION AND CONTROL
Kumpati S. Narendra and Prabhaker Kudva May 1974 31 p refs
(Contract N00014-67-A-0097-0020; NR Proj. 375-131)
(AD-780891; CT-61) Avail: NTIS CSCL 12/1

In another paper, schemes were developed for the identification and control of multivariable systems when all the state variables are accessible. In this report, the main attempt has been to remove this stringent requirement. For a single-input single-output system a unified procedure is developed for designing and adaptive observer which simultaneously estimates the state of the system as well as its parameters. These estimates can then be used to determine suitable feed-forward and feedback controllers for the system. GRA

N74-33012# Bureau of Mines, Denver, Colo. Mining Research Center.
A COMPTUER PRGORAM FOR CLUSTERING DATA POINTS ON THE SPHERE
Robert J. Shanley and M. Ashraf Mahtab 11 Mar. 1974 63 p refs
(PB-231285/8; BM-IC-8624) Avail: NTIS HC $3.75 CSCL 12A

The computer program, HYBMODE, has been developed to meet the need for a fast and economical method for clustering data points on the sphere. The algorithm used in this development is an extension of D. Wishart's one-level mode analysis. The program can be utilized in the analysis of either vectorial or axial data and is currently being used in the analysis of fracture orientations. Author (GRA)

N74-33013# Brown Univ., Providence, R.I. Lefschetz Center for Dynamical Systems.
A BIFURCATION PROBLEM FOR A NONLINEAR PARTIAL DIFFERENTIAL EQUATION OF PARABOLIC TYPE
N. Chafee and E. F. Infante Mar. 1974 40 p refs
(Contract N00014-67-A-0191-0009; Grant AF-AFOSR-693-67; NR Proj. 041-397)
(AD-779860; CDS-TR-74-5) Avail: NTIS CSCL 12/1

The authors consider the boundary value problem u sub t = (u sub xx) + (lambda) f(u), (0 < or = x < or = pi, 0 < t < infinity); u) sub x = 0 = u) sub x = pi = 0, (0 < or = t > infinity) (*);u) sub t = 0 = phi (x), (0 < or = x < or = pi). (Modified author abstract) GRA

N74-33014# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Electrical Engineering and Electrophysics.
CONTROL AND DYNAMIC REPAIRMAN ASSIGNMENT FOR STOCHASTIC LINEAR SYSTEMS
Leonard Shaw and Jason Hsuan 1 May 1974 12 p refs
(Contract N00014-67-A-0438-0013; Grant NSF GK-40185; NR Proj. 024-301)
(AD-780910; PINY-EE/EP-74-013; PINY-EER-111) Avail: NTIS CSCL 12/1

Quadratic performance is considered for systems with random jump parameters. This model represents a system with a finite number of components which fail independently, each with an exponential failure time distribution. The mean loss is to be minimized by adjusting both the feedback control and the number of repairmen available to effect repairs, one man per component, with a common exponential repair time distribution. Several kinds of performance intervals are considered: one step of random duration, a fixed number of steps, a random but finite number of steps, and an infinite duration. The number of repairmen may be changed at each failure or repair time. Author (GRA)

N74-33015# Wisconsin Univ., Madison. Mathematics Research Center.
ACCELERATING PROCEDURES FOR METHODS OF CONJUGATE DIRECTIONS Summary Report, Apr. 1974
Klaus Ritter Apr. 1974 49 p refs
(Contract DA-31-124-ARO(D)-462)
(AD-780648; MRC-TSR-1398) Avail: NTIS CSCL 12/2

The directions of descent generated by a method of conjugate directions are used to perform special steps which accelerate the rate of convergence of these methods. Independent of the number of variables a 2-step superlinearly convergent method can be obtained. (Modified author abstract) GRA

N74-33016# General Research Corp., Santa Barbara, Calif.
BULK TURBULENCE EQUATIONS FOR FIREBALL MODELING Releasable Memo, 1 Apr. 1973 - 1 Feb. 1974
H. H. King and A. Q. Eschenroeder Feb. 1974 39 p refs
(Contract DNA001-73-C-0192; DNA Proj. NWED-QAKH)
(AD-781278; GRC-RM-1881; DNA-3358T) Avail: NTIS CSCL 18/3

Under the assumption that fireball turbulence is homogeneous, relationships are derived to allow the calculation of velocity, enthalpy, and electron density fluctuations. Electron statistics are related to enthalpy statistics through thermochemical equilibrium calculations and the construction of probability density functions. The autocorrelation function for electron density is related to that of the enthalpy fluctuations. A numerical procedure is developed for obtaining electron density profiles derived from an enthalpy fluctuation field having a specified autocorrelation. Author (GRA)

N74-33017# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
STUDY OF CONTROL OF PARTIAL DIFFERENTIAL EQUATION SYSTEMS WITH FLIGHT CONTROL APPLICATIONS Final Report, 1 Mar. 1973 - 28 Feb. 1974
Keith D. Graham 28 Feb. 1974 60 p refs
(Contract F44620-72-C-0044; AF Proj. 9769)
(AD-780593; F0132-FTR3; AFOSR-74-0896TR) Avail: NTIS CSCL 12/1

The report discusses linear quadratic optimal control results for distributed parameter systems. Two systems are considered - the flexible string and the circular membrane - both with control operating only on the boundary of the physical medium. Quadratic optimal controllers for these systems are shown to depend heavily on boundary measurements made at the same point where the control is applied. The controllers effectively attenuate wave processes with nearly uniform damping of all natural vibration modes. Author (GRA)

N74-33018# Georgia Univ., Athens. Dept. of Statistics and Computer Science.
CURVE FITTING BY THE METHOD OF MOMENTS
Hubert Bouver Dec. 1973 90 p refs
(Contract N00014-69-A-0423; NR Proj. 042-261)
(AD-780568; TR-102; THEMIS-UGA-29) Avail: NTIS CSCL 12/1

The purpose of the report is to present a method of graduating observed frequency distribution using a computer package which is designed to aid the user in choosing among several distributions the frequency curve that will best fit his data. Author (GRA)

N74-33019# State Univ. of New York, Buffalo. Statistical Lab.
SOME RECENT ADVANCES IN TIME SERIES MODELING
E. Parzen May 1974 33 p refs
(Contract N00014-72-C-0508)
(AD-781873; TR-10) Avail: NTIS CSCL 12/1

The aim of the paper is to describe some of the important concepts and techniques which may provide realistic models for the processes generating observed time series. (Modified author abstract) GRA

N74-32510* Kanner (Leo) Associates, Redwood City, Calif.
LINCOS: AN INTERPLANETARY LANGUAGE
H. Freudenthal *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 111-127 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 306-317 (For availability see N74-32500 22-04)
CSCL 12A

N74-32636 Michigan Univ., Ann Arbor.
COMPARISON OF METHODS FOR CONVERTING BETWEEN PRESSURE AND HEIGHT SURFACES
Grant Branstator *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 1-9 (For availability see N74-32635 22-08)

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N74-33020*# Kanner (Leo) Associates, Redwood City, Calif.
CONTRIBUTIONS ON THE CLIMATE OF THE BERN ENVIRONS: SELECTED PROBLEMS AND PRELIMINARY RESULTS
B. Messerli, A. Krummen, R. Maurer, P. Messerli, H. Wanner, H. Mathys, and M. Winiger Washington NASA Sep. 1974 46 p refs Transl. into ENGLISH from Beitr. zum Klima des Raumes Bern: Ausgewaehlte Probl. und Vorlaufige Ergebnisse (Bern), v. 5, 1970-1972 p 45-78
(Contract NASw-2481)
(NASA-TT-F-15883) Avail: NTIS HC $5.50 CSCL 04B

The importance of and methods for studying the interaction of man and the meteorological environment are discussed. Insolation, considered the most important factor relating to the bioclimate and urban planning, is mapped over part of the Bern conurbation. Other information analyzed as a function of time and topography includes wind patterns, temperature curves, snow coverage and its duration, and data obtained from satellite photos taken in different regions of the spectrum. Requirements are outlined for a network of stations to measure parameters affecting climate and air pollution, and for processing systems to allow extrapolation with respect to both time and location. Author

N74-33021*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FOUR-D GLOBAL REFERENCE ATMOSPHERE TECHNICAL DESCRIPTION, PART 1
C. G. Justus, A. W. Woodrum, R. G. Roper, and O. E. Smith Sep. 1974 114 p refs
(NASA-TM-X-64871) Avail: NTIS HC $8.75 CSCL 04B

An empirical atmospheric model was developed which generates values for pressure, density, temperature, and winds from surface levels to orbital altitudes. The output parameters consist of components for: (1) latitude, longitude, and altitude dependent monthly and annual means; (2) quasi-biennial oscillations; and (3) random perturbations to simulate partially the variability due to synoptic, diurnal, planetary wave, and gravity wave variations. Quasi-biennial and random variation perturbations are computed from parameters determined from various empirical studies and are added to the monthly mean values. This model has been developed as a computer program called PROFILE which can be used to generate altitude profiles of atmospheric parameters along any simulated trajectory through the atmosphere. The PROFILE program was developed for design applications in the space shuttle program. Other applications of the model are discussed, such as for global circulation and diffusion studies, and for generating profiles for comparison with other atmospheric measurement techniques, (e.g. satellite measured temperature profiles). Author

N74-33022*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FOUR-D GLOBAL REFERENCE ATMOSPHERE USERS MANUAL AND PROGRAMMERS MANUAL, PART 2
C. G. Justus (Georgia Inst. of Tech.), A. W. Woodrum (Georgia Inst. of Tech.), R. G. Roper (Georgia Inst. of Tech.), and O. E. Smith Sep. 1974 213 p refs
(Contract NAS8-29753)
(NASA-TM-X-64872) Avail: NTIS HC $13.75 CSCL 04B
For abstract, see N74-33021.

N74-33023# World Meteorological Organization, Geneva (Switzerland).
PRE-GATE TESTS AND STUDIES FOR THE GARP ATLANTIC TROPICAL EXPERIMENT
May 1974 174 p refs Prepared jointly with Intern. Council of Sci. Unions
(GATE-2) Avail: NTIS HC $11.75; WMO, Geneva

Preliminary studies made in preparation for GATE are presented. These include an account of the 1972 U.S.S.R. expedition to the eastern Atlantic; meteorological parameter variations in the ITCZ; the interaction between the atmospheric and oceanic boundary layers; a spectrum analysis of wind, heat, and moisture fluctuation in the oceanic boundary layer; and an analysis of tropical depressions off Senegal. For individual titles, see N74-33024 through N74-33029.

N74-33024 Hydrometeorological Scientific Research Center (USSR).
MAIN OBJECTIVES AND SOME RESULTS OF THE NATIONAL EXPEDITION OF THE USSR: "TROPEX-72' (6 JUNE - 19 SEPTEMBER 1972)
M. A. Petrossiants *In* WMO Pre-GATE Tests and Studies for the GARP Atlantic Trop. Expt. May 1974 28 p refs (For availability see N74-33023 22-20)

The composition of the expedition, location, and routes of the ship are described and the observational program summarized. Large scale features of circulation of the atmosphere and the ocean in the tropics during the summer of 1972 are discussed, and the ITC2 structure and disturbances are investigated. ESRO

N74-33025 Institute of Experimental Meteorology (USSR).
ON SOME CHARACTERISTIC TIME SCALES OF METEOROLOGICAL ELEMENT VARIATIONS IN THE INTERTROPICAL CONVERGENCE ZONE AND THE TRADE WIND ZONE
V. N. Ivanov, M. A. Petrossiants (Hydrometeorol. Res. Center), and L. T. Myatch *In* WMO Pre-GATE Tests and Studies for the GARP Atlantic Trop. Expt. May 1974 19 p refs (For availability see N74-33023 22-20)

The 1972 Soviet National Tropical Experiment made it possible to obtain data of some meteorological elements (air and water temperature, meridional and zonal wind components, surface pressure) in the equatorial Atlantic. Since the time series was short, attention was paid to an investigation of power spectral ranges with periods up to four days (B and C scales). The intensity of inhomogeneities in the turbulent spectral range was evaluated. ESRO

N74-33026 Hydrometeorological Inst., Leningrad (U.S.S.R.)
INTERACTION BETWEEN THE BOUNDARY LAYERS OF THE ATMOSPHERE AND OCEAN ACCORDING TO THE DATA OF TROPEX-72
K. L. Egorov, D. L. Laikhtman, and V. M. Radikevich *In* WMO Pre-GATE Tests and Studies for the GARP Atlantic Trop. Exit. May 1974 13 p refs (For availability see N74-33023 22-20)

To tackle the problem of parameterization of processes in boundary layers, an analysis was made of characteristic peculiarities of the structures of atmospheric and oceanic boundary layers at low latitudes as revealed by data obtained aboard the Academician Kurchatov in the eastern tropical North Atlantic during 1972. The structure of the boundary layers is also described by models formulated for middle latitudes. The analysis of the experimental data and its comparison with the theoretical model confirms that Ekman's boundary layer model may be down to about latitude 5 deg. ESRO

N74-33027 Academy of Sciences (USSR), Moscow. Inst. of Atmospheric Physics.
SPECTRA AND COSPECTRA OF THE TURBULENT FLUCTUATIONS OF THE VELOCITY, TEMPERATURE AND HUMIDITY IN THE BOUNDARY LAYER OVER THE OCEAN
L. G. Elagina, B. M. Koprov, and J. A. Volkov *In* WMO Pre-GATE Tests and Studies for the GARP Atlantic Trop. Expt. May 1974 10 p refs (For availability see N74-33023 22-20)

Simultaneous measurements of the turbulent fluxes of heat, moisture, and momentum, as well as other characteristics of turbulence were made in the eastern tropical North Atlantic during 1972. The results of spectrum analysis of the data are briefly presented and discussed. ESRO

N74-33028 Agency for Air Navigation Safety in Africa Dakar (Senegal).
AN ANALYSIS OF TWO WEATHER DISTURBANCES DEVELOPING INTO TROPICAL DEPRESSIONS OFF DAKAR
G. Dhonneur, L. Finaud, , R. Garnier, R. Gaucher, and D. Rossignol *In* WMO Pre-GATE Tests and Studies for the GARP Altantic Trop. Expt. May 1974 60 p refs (For availability see N74-33023 22-20)

The evolution of two African easterly waves into tropical depressions just off the coast of Senegal is described. Data collected by the synoptic meteorological network were used for the study. The easterly waves are fairly well described over Dakar, but it is shown that the smaller scale features are not resolved by the network. It is not possible to describe the complete interaction processes involved in the formats of the depression, but it is shown that the structure of the disturbance over land is an important factor which determines their future evolution over the ocean. ESRO

N74-33029 Deutscher Wetterdienst, Hamburg (West Germany).
THE SEASONAL AND SECULAR VARIATIONS OF THE METEOROLOGICAL PARAMETERS ON BOTH SIDES OF THE ITCZ IN THE ATLANTIC OCEAN
Otto Hoeflich *In* WMO Pre-GATE Tests and Studies for the GARP Atlantic Trop. Expt. May 1974 37 p (For availability see N74-33023 22-20)

Fluctuations of marine meteorological parameters, including air and sea surface temperature, wind, atmospheric pressure, cloudiness, and precipitation, in the Atlantic Intertropical Convergence Zone are summarized. ESRO

N74-33030# California Univ., Livermore. Lawrence Livermore Lab.
CLIMATE STUDIES USING A ZONAL ATMOSPHERIC MODEL
M. C. MacCracken and F. M. Luther 14 Jan. 1974 41 p refs Presented at 1st Spec. Assembly of the Intern. Assoc. of Meteorol. and Atmospheric Phys., Melbourne, 14-25 Jan. 1974 (Contract W-7405-eng-48)
(UCRL-74887; Conf-740106-2) Avail: NTIS HC $5.25

The second generation zonal atmospheric model ZAM2 is being developed and applied to studies of the potential climatic impact of stratospheric injection of trace species by high altitude aircraft. The model is a two-dimensional general circulation model using a 5 deg latitude grid at nine pressure levels extending into the stratosphere. The effect of terms lost by zonal averaging is simulated by introduction of an eddy transport mechanism in which the eddy diffusion coefficient is a function of internal model variables. ZAM2 strives to model the thermodynamics and hydrology of a moist atmosphere under the influence of solar and long wave radiation, and includes precipitation, cloudiness, convection and surface interactions. The planetary surface is represented as fractionally divided at each latitude band between open ocean, sea ice, and land which may have mountains of various heights. Author (NSA)

N74-33031# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Apr. 1974 [OBSERVATIONS CLIMATOLOGIQUES]
Apr. 1974 15 p In FRENCH and DUTCH
Avail: NTIS HC $4.00

Meteorological parameters observed at different Belgian weather stations during April 1974 are given. ESRO

N74-33032# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION. PART 1: SMOKE AND SULFUR DIOXIDE. PART 2: PRECIPITATION MEASUREMENTS USING STORAGE GAGES Monthly Bulletin, Mar. 1973 [POLLUTION ATMOSPHERIQUE I. FUMEE ET ANHYDRIDE SULFUREUX II. MESURE DES RETOMBEES AU MOYEN DES JAUGES DE DEPOT]
Mar. 1973 37 p In FRENCH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemiol.
Avail: NTIS HC $5.00

Air pollution data obtained at Belgian weather stations for March 1973 are tabulated. The air pollution apparatus and rain gage are briefly described. ESRO

N74-33033# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION. PART 1: SMOKE AND SULFUR DIOXIDE. PART 2: PRECIPITATION MEASUREMENTS USING STORAGE GAGES Monthly Bulletin, Apr. 1973 [POLLUTION ATMOSPHERIQUE I. FUMEE ET ANHYDRIDE SULFUREUX II. MESURE DES RETOMBEES AU MOYEN DES JAUGES DE DEPOT]
Apr. 1973 37 p In FRENCH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemiol.
Avail: NTIS HC $5.00

Data obtained at Belgian weather stations for April 1973 are tabulated. The air pollution apparatus and rain gage are briefly described. ESRO

N74-33034# Royal Netherlands Meteorological Inst., De Bilt.
SYNOPTIC AND UPPER AIR OBSERVATIONS IN THE NETHERLANDS, VOLUME 17, 1972
1974 394 p In ENGLISH and DUTCH
(KNMI-142-17) Avail: NTIS HC $2.75; Roy. Neth. Meteorol. Inst. F12,50

Observations made during 1972 and recorded at meteorological stations in the Netherlands, on-board light vessels and from an automatic weather station on a platform in the North Sea are tabulated. Data concerning pressure, temperature, relative humidity, and wind in the upper air were obtained using a

radiosonde upper air wind direction and velocity by radar measurements. ESRO

N74-33035# Israel Program for Scientific Translations, Ltd., Jerusalem.
NUCLEAR METEOROLOGY
K. P. Makhonko, ed. and S. G. Malakhov, ed. 1974 388 p refs Transl. into ENGLISH of the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 Sponsored by US-Israel Binatl. Sci. Found.
(TT-74-50011; ISBN-0-7065-1445-9) Avail: NTIS HC $22.50
CSCL 18H

The accumulations of radioactive products from nuclear explosions in the atmosphere and soil are studied by hydrometeorological means. For individual titles, see N74-33036 through N74-33089.

N74-33036 Israel Program for Scientific Translations, Ltd., Jerusalem.
VERTICAL DISTRIBUTION OF RADIOACTIVE AEROSOLS IN THE TROPOSPHERE OVER THE EUROPEAN USSR IN 1964 - 1967 c13
L. E. Nazarov, L. A. Volokitina, Ya. I. Gaziev, A. F. Kuzenkov, S. G. Malakhov, and A. S. Vasilev *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 1-16 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

Data are given on the vertical distribution of the concentration of decay products of radon and aerosol products of nuclear blasts in the troposphere over the U.S.S.R. in 1964 - 1967. Aerosynoptic analysis of cases of considerable growth and decrease in the concentration of fission products in the ground air layer in the vicinity of Moscow established that the drift of stratospheric aerosols into the upper troposphere takes place at the tropopause discontinuity or funnel at the cyclonic periphery of the jet. At ground level the radioactive spot appears most frequently beneath the anticyclonic periphery of the jet. Examination of the simplest theoretical models of the vertical concentration distribution of fission products and short lived decay products of radon in the troposphere yields the coefficient of vertical turbulent diffusion and speed of vertical ordered motion. Author

N74-33037 Israel Program for Scientific Translations, Ltd., Jerusalem.
DISTRIBUTION OF FISSION PRODUCTS OVER OCEANS IN THE TROPICAL ZONE AND THEIR RELATION TO ATMOSPHERIC PROCESSES
G. V. Dmitrieva, Yu. K. Krasnopevtsev, and S. G. Malakhov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 17-28 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

New data (for the period 1967 - 1968) are examined regarding the latitudinal distribution of the concentration of fission products over oceans in different regions of the tropical zone. The data show that the air at sea level in the tropical zone over the Indian Ocean and the West Pacific in the considered period is very inhomogeneous as regards the content of radioactive products. This inhomogeneity was caused by the influx in the tropical zone of air with higher radioactivity from subtropical or moderate latitutdes (winter hemisphere) after the passage in these latitudes of quasi-meridional cold fronts. These incursions contribute sometimes also to the formation of separate zones of convergence lines in the equatorial region. Under certain synoptic conditions, the air entering the equatorial region from extratropical latitudes at times crosses the equator and is included in the circulation of the other hemisphere. Author

N74-33038 Israel Program for Scientific Translations, Ltd., Jerusalem.
DETERMINATION OF RADIOISOTOPE FALLOUT FROM ITS CONTENT IN CHRONOLOGICAL LAYERS OF HIGH ALTITUDE GLACIERS c13
E. N. Davydov, K. P. Makhonko, M. A. Tsevelev, and Z. S. Shulepko *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 29-36 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The contents of Sr-90, Cs-137, Ce-144, Mn-54, Ru-106, and Pb-210 are determined in chronological layers of neve and ice in high altitude glaciers of the Caucasus and Tyan-Shan. The annual fallout of Cs-137 determined by means of a cuvette type collector is found to agree satisfactorily with the fallout determined from the Cs-137 content in the chronological layers of the glacier in the period 1963 - 1967. A similar comparison for Sr-90 in the period 1956 - 1967 showed that the proportion of Sr-90 contained in the chronological layers of these glaciers is about 10% of the atmospheric fallout of the isotope, which corresponds roughly to the proportion of Sr existing in indissoluble form. It is shown that about 90% of Sr-90 and roughly 40% of Pb-210, falling on the glacier surface from the atmosphere, are eliminated together with the melted snow, while Cs-137 hardly migrates at all. The time variation in the fallout of different isotopes, determined from their content in chronological layers of the glaciers, led to the following value for the half removal period of isotopes of fission products from the atmosphere: T sub 1/2 approximately 11 months. The figure for Mn-54 is T sub 1/2 approximately 28 months. Author

N74-33039 Israel Program for Scientific Translations, Ltd., Jerusalem.
RADIOACTIVE ISOTOPES OF EUROPIUM PRODUCED BY NUCLEAR BLASTS c24
S. V. Iokhelson, I. M. Nazarov, F. Ya. Rovinskii, V. P. Chirkov, and E. I. Yushkam *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 37-39 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

Nuclear blasts lead to the appearance of different radioisotopes of europium: europium-155, europium-156, which are fission fragments, and europium-152, europium 154 - products of activation reactions. To determine the contribution of long lived europium radioisotopes to the global contamination of a locality, a sample of moss gathered in the Caucasus was analyzed by the methods of radiochemistry and gamma spectrometry. In the sample, in addition to other fragmentation products, the presence of europium-155 was detected and identified reliably for the first time. It was also established reliably that no europium-152 and 154 is present. The density of the global contamination of dry land by europium-155 and its contribution to the gamma radiation dose were hence evaluated. Author

N74-33040 Israel Program for Scientific Translations, Ltd., Jerusalem.
SOME CHARACTERISTICS OF UPPER CLOUDS AND SUGGESTIONS REGARDING THE UTILIZATION OF RADIOACTIVE TRACERS IN MERIDIONAL FLOWS
N. N. Romanov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 40-41 Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 04A

The analysis of numerous reports of aircraft pilots leads to the establishment of a relationship between the development of upper clouds and the direction of wind with a large meridional component. Independently of the character of the baric field, the clouds develop under southern and southwestern stable flows and are destroyed (or are absent) by northern and northeastern flows. This relationship is expressed more strongly in low latitudes and is weaker in high latitudes. It is assumed that such a relationship results from stable vertical currents of positive or negative sign, appearing in meridional flows on the rotating earth. It is suggested that direct measurement of vertical motions be conducted with the aid of radioactive tracers during a rationally selected synoptic situation. Author

N74-33041 Israel Program for Scientific Translations, Ltd., Jerusalem.
MEAN AND TURBULENT TRANSFER OF SUBSTANCES OVER THE USSR c13
I. G. Guterman *In its* Nucl. Meteorol. (TT-74-50011) 1974

p 42-56 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 04A

The relation is examined between the mean and turbulent fluxes of substances at the limit of the atmospheric boundary layer in January and July over the U.S.S.R. It is shown that the intensity of macroturbulent fluctuations, characterized by the ratio of the vectorial standard deviation of wind to the modulus of the resultant wind, is equal to 100-500% in winter and 200-2,000% in summer. Turbulent heat fluxes in January hardly attain 1-3% of the fluxes due to the mean motion, while in July this ratio increases to 4-7%. Therefore, the practically horizontal heat fluxes at that level can be calculated from data on the mean temperature and resultant wind. Horizontal turbulent moisture fluxes make a more important contribution to the total moisture flux. At 1.5 km, the ratio of the turbulent moisture flux to the moisture carried by the mean motion fluctuates between 20 and 180%, and in July between 40 and 140%. Over the U.S.S.R., within a single season the regions of increased and reduced turbulence of the fluxes of the three considered substances coincide roughly. The direction of the turbulent moisture fluxes almost coincides with that of the horizontal gradients of mean absolute humidity. Author

N74-33042 Israel Program for Scientific Translations, Ltd., Jerusalem.
RATE OF ATMOSPHERIC FALLOUT OF CESIUM-137 AND STRONTIUM-90 AEROSOLS c24
A. S. Zykova, E. L. Telushkina, V. P. Rublevskii, G. P. Efremova, and G. A. Kuznetsova *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 57-60 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

Data are given on the fallout density of Cs-137 and Sr-90 aerosols in Moscow for the period 1962 to 1968 and on the concentration of these isotopes in the ground layer of atmospheric air. It is shown that the ratio of Cs-137 and Sr-90 aerosols in radioactive precipitation in these years was always larger than the analogous ratio between these isotopes in air. This leads us to suppose that the fallout rate of aerosols carrying Cs-137 is somewhat larger than the fallout rate of aerosols carrying Sr-90. An assessment of the fallout rate of these aerosols established that, on the average, for the period 1962 to 1968 the fallout rate of Cs-137 aerosols was 1.7 + or - 0.4 cm/sec, and of Sr-90 aerosols 1.5 + or - 0.4 cm/sec, i.e., the fallout rate of Cs-137 aerosols is larger by 14% than the fallout rate of Sr-90 aerosols. Author

N74-33043 Israel Program for Scientific Translations, Ltd., Jerusalem.
ACCUMULATION OF STRONTIUM-90 IN SOILS c13
E. B. Tyuryukanova *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 61-66 (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (For availability see N74 33035 22-20)
CSCL 18H

A very uneven distribution of Sr-90 is observed in the soils of the Russian Plain. The content of this radioactive nuclide in sandy soils is lower than in loamy soils, and depends on the amount of soil humus and its qualitative composition. The accumulation of Sr-90 in soils is determined both by its physicochemical composition, and by the landscape and geochemical conditions. Of great importance is the character of the runoff. In most soils Sr-90 is concentrated in the upper layer (0-5 to 0-20 cm). Author

N74-33044 Israel Program for Scientific Translations, Ltd., Jerusalem.
CESIUM-137, STRONTIUM-90, AND LEAD-210 IN SOIL OF THE FAR NORTH REGIONS c13
M. N. Troitskaya, M. S. Ibatullin, B. Ya. Litver, A. N. Nizhnikov, P. V. Ramzaev, and L. A. Teplyka *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 67-71 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The part played by soil in the pollution of subsequent links of the chain of natural and artificial radionuclides in regions of the Far North is considered. It is shown that while a geographic variation exists of the levels of artificial contamination of the soils, the ratio of cesium-137 to strontium-90 in all regions remains between 1.3 and 1.6. Experimental data are given on the mechanism governing the contamination of lichen (the main fodder of reindeer) by natural and artificial nuclides. An analysis is given of museum samples (1900-1945), indicating the absence of any connection between the high levels of lead-210 in the Far North and nuclear tests. The levels of plutonium-239 content in the vegetation of some regions of the Far North are determined. Author

N74-33045 Israel Program for Scientific Translations, Ltd., Jerusalem.
COMPARATIVE DISTRIBUTION OF STRONTIUM-90 AND CESIUM-137 IN DIFFERENT TYPES OF SOILS c13
E. I. Belova and Z. G. Antropova *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 72-75 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

Results are presented of investigations into the distribution of strontium-90 and cesium-137 along the profile of five types of virgin soil 10 years after their contamination. The investigations were conducted under natural conditions on artificially contaminated plots of sod podzolic, gray forest, leached chernozem, meadow solod and solonchak soils. It is shown that by the tenth year some characteristic features are observed in the distribution of the investigated radioisotopes along the profile of different types of soils. The influence of the forest cover on the migration rate and distribution of radioisotopes along the soil profile is noted. The soils are arranged in the following series according to the content of cesium-137 in the upper layer (0-4 cm): meadow solod smaller than sod podzolic smaller than gray forest smaller than solonchak smaller than leached chernozem. The series for strontium-90 content is as follows: meadow solod smaller than sod podzolic smaller than solonchak smaller than gray forest smaller than leached chernozem. Author

N74-33046 Israel Program for Scientific Translations, Ltd., Jerusalem.
DISTRIBUTIONS AND MIGRATION OF STRONTIUM-90 IN SOILS c13
L. I. Gedeonov, S. P. Rosyanov, and V. K. Vinogradova *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 76-84 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

Results are given of a study of Sr-90 distribution along soil profiles. These data can be used in an attempt to study the mechanism of Sr-90 migration in soil. It was found that Sr-90 in 1964-1965 was mainly retained in a 15-cm soil layer. Measurable amounts of Sr-90 were found in the 25 - 30 cm layer. The distribution of Sr-90 along the profile of loamy soils can be described in a first approximation by a power law. Calculations with its aid show that Sr-90 penetrates deeper than 40 - 60 cm. The motion of radioactive fission products inside the soil cover involves a combination of different physicochemical processes in the soil, the most important of which are Sr-90 migration by diffusion and isotope migration together with the soil solution. The dependence of the rate of Sr-90 diffusion on the soil moisture content and temperature was determined. It was found that the diffusion coefficients in chernozem and sod podzolic soils for yearly averages of the moisture content are 0.49 x 10 to the minus 7th power and 0.84 x 10 to the minus 7th power sq cm/sec, respectively. The vertical distribution of Sr-90 in soils resulting from diffusion alone was calculated with the aid of the coefficient found. Comparison of the calculated distribution of Sr-90 with the distribution obtained by radiochemical determination of Sr-90 showed that in loamy chernozem Sr-90 migrates mainly by diffusion. In sandy sod podzolic soil this process is of the same order as the others. Author

N74-33047 Israel Program for Scientific Translations, Ltd., Jerusalem.
HORIZONTAL WATER MIGRATION OF STRONTIUM-90 **c13**
I. G. Vodovozova *In its* Nucl. Meteorol. (TT-74-5001) 1974 p 85-87 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk) Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

During spring snowmelting, radioactive strontium deposited on the earth's surface participates with melted snow in migration processes. Data are presented on the physicochemical state of strontium-90 migrating with water; 73% of strontium-90 falling with snow is in cationic form. Atmospheric precipitation is deposited in the soil, participates in the migration processes, and subsequently leaches mainly soluble strontium-90 from the soil and its proportion in cationic form in the melted snow and river water increases to 100%. Existing in an easily mobile cationic form, strontium-90 is discharged in the river together with floodwaters. Author

N74-33048 Israel Program for Scientific Translations, Ltd., Jerusalem.
FORMATION OF RADIOACTIVE PARTICLES DURING NUCLEAR BLASTS IN THE TROPOSPHERE **c13**
Yu. A. Izrael and A. A. Ter-Saakov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 88-94 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

A theoretical model of aerosol radioactivation in the fireball of a nuclear burst is examined. Formulas are derived for the distribution of the radioactivity of isotopes on the aerosol particles as a function of particle radius. Three mechanisms of particle radioactivation are treated. In the first case, condensation of radioactive isotope vapors occurs at temperatures higher than the vaporization temperature of the soil particles, i.e., under conditions far removed from thermodynamic equilibrium. Such is the case for isotopes of zirconium, lanthanum, yttrium and other refractory elements. In the second case the condensation of radioisotopes occurs on the surface of fused soil particles, i.e., under conditions of thermodynamic equilibrium. In the third case aerosol activation is determined by radioisotope sorption on the surface of solid particles. Such is the case for isotopes which have gaseous precursors with half decay periods from tens of seconds to several minutes (Sr-89, Sr-90, Cs-137, Ba-140). The influence of the precipitation of large particles from a cloud at the moment of radioactivation is taken into account. Author

N74-33049 Israel Program for Scientific Translations, Ltd., Jerusalem.
CALCULATION OF FRACTIONATION EFFECTS IN ATMOSPHERIC NUCLEAR BURSTS
Yu. A. Izrael *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 95-100 (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (For availability see N74-33035 22-20)
CSCL 18H

A theoretical calculation is given of the coefficients of fractionation of radioactive isotopes in aerosols, formed during nuclear bursts. The calculations are conducted on the assumption of thermodynamic equilibrium between the liquid and gaseous fractions with the utilization of Raoult's law. The results are given for the fraction of radioactive isotopes of the most important mass chains condensing on the aerosols as a function of time after burst. Also calculated are the coefficients of fractionation for the isotopes Te-132, Sr-90, Sr-89 and Cs-137 in the form of functions of particle radius (the time of particle solidification is 7 sec). The calculations are performed for the nearest trace of the surface blast. The derived theoretical correlation curve of fractionation of the series of isotopes agrees satisfactorily with measurements of isotope fractionation at the nearest trace of low strength nuclear explosion. Author

N74-33050 Israel Program for Scientific Translations, Ltd., Jerusalem.
THE ATMOSPHERIC FORMATION OF SECONDARY AEROSOLS DURING VENTILATED UNDERGROUND NUCLEAR TESTS
V. N. Petrov and A. A. Ter-Saakov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 101-103 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

In underground nuclear tests, some radioactive products may be discharged into the atmosphere through excess pressure or ventilation due to the destruction of rocks in the test area and the formation of cracks near to ground level. The direct outflow into the atmosphere of nongaseous radioactive products is hardly probable, due to their sorption in the subsoil rock layer. It is therefore natural to assume that, in the main, chemically inert gases (such as the isotopes of krypton and xenon) are discharged into the atmosphere. The appearance of nonvolatile radioisotopes in the atmosphere can be associated with the decay of radioactive gases, which are the precursors of such isotopes in the corresponding chains of radioactive transformations. Nongaseous radioisotopes formed in the atmosphere are deposited on atmospheric dust particles and form so-called secondary aerosols. A model of the atmospheric formation of the decay products of gaseous radioisotopes during underground nuclear tests is examined. Author

N74-33051 Israel Program for Scientific Translations, Ltd., Jerusalem.
SIZE DISTRIBUTION OF HIGH ACTIVITY PARTICLES IN THE TROPOSPHERE IN SEPTEMBER - DECEMBER 1967 **c13**
Ya. I. Gaziev, S. G. Malakhov, and L. E. Nazarov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 104-110 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

High activity particles of artificial radioactive aerosols were observed in the troposphere in September - December 1967. The age of the aerosols at the beginning of the observation period was approximately 2.5 months. Radioactive particles of diameter d much larger than 0.9 micron were investigated. According to the results obtained in the ground layer of the atmosphere and the upper troposphere, the integral and differential size distribution of these particles was exponential for d much larger than 0.9 micron. On the average for the troposphere the exponent was equal to (1.4 + or - 0.2) d micron/1. For radioactive particles of diameter between 2 and 6 microns, the fractionation coefficients of the isotopes Ce-144, Ce-141 and Ru-103 were determined with respect to Zr-95. The values of these coefficients were roughly the same as those given earlier in the literature for micron particles of atmospheric nuclear blasts. The time of residence in the stratosphere of particles of diameter between 2.5 and 6 micron was roughly 4.5 months. The scavenging rate of radioactive particles of micron size in the lower troposphere was close to 2 km/day. Author

N74-33052 Israel Program for Scientific Translations, Ltd., Jerusalem.
STATE OF STRONTIUM-90, CESIUM-137, AND CERIUM-144 IN RADIOACTIVE FALLOUT **c24**
F. I. Pavlotskaya, R. Surotkevichiene, and G. P. Levina *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 111-117 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. No. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The state and chemical form of existence of Sr-90, Cs-137 and Ce-144 in global fallout during 1958-1968 are studied. Substantial differences are shown between the soluble and insoluble fractions in the distributions of the different radionuclides. Independently of the geographical location of the observation stations, the decreasing soluble fraction in the indicated period is preserved in the sequence Sr-90 greater than Cs-137 greater than Ce-144, the values being on the average 78, 62 and 16%, respectively. The radionuclides in the insoluble fraction possess different mobilities. When treating the insoluble remainder by 1N CH3COONH4 and 1N HCl, more than 90% of the Sr-90

and up to 65-70% of the Cs-137 and Ce-144 pass into the solution. The latter indicates that most of the radionuclides in the insoluble fraction are in exchange and mobile states. In a soluble state, the radionuclides are present in cationic, anionic and neutral forms. The ratios between the latter are different in the various radionuclides. The different mobility of the radionuclides in insoluble fractions and their existence in cationic, anionic and neutral forms in a soluble state indicate the formation of different compounds and the variety of forms of their arrival at the earth's surface. Author

N74-33053 Israel Program for Scientific Translations, Ltd., Jerusalem.
SOME THEORETICAL NOTIONS OF RADIOACTIVITY ACQUISITION BY RAINDROPS **c13**
A. S. Avramenko and K. P. Makhonko *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 118-132 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

An approximation model is given of the acquisition of radioactivity by raindrops during their formation and precipitation from a cloud. The processes taking place in a cloud with ordered ascending currents, leading to the size distribution of the specific radioactivity of raindrops observed on the earth, are examined. Comparison of theoretical calculations of the concentration of the products of nuclear bursts in raindrops of different sizes with experimental data determines the value of the coefficient of radioactive aerosol-particle washout by cloud borne droplets and establishes the existence of an inverse relationship between the concentration of nuclear burst products in cloud borne droplets and their radius. This relationship is near inverse for raindrops. It is shown that the obtained size distribution of the specific radioactivity of raindrops can lead to an increase in the specific radioactivity of rainwater at the end of brief showers due to the decrease in raindrop size. Author

N74-33054 Israel Program for Scientific Translations, Ltd., Jerusalem.
DISTRIBUTION OF RAINDROPS WITH RESPECT TO SPECIFIC RADIOACTIVITY **c13**
B. I. Styro and B. K. Vebrene *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 133-136 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The distribution of raindrops was investigated with respect to their specific radioactivity. The distribution curves of droplets are similar for a uniform distribution of the isotope and when it is introduced at some point in the cloud. The position of the maximum on the curve depends on the isotope quantity. The variation in the specific radioactivity of rain during its fall was also investigated. The first specific radioactivity maximum appears several minutes after the isotope is introduced in the cloud. The second, not so sharp maximum appears after 10-15 min. The very rapid (3-4 min) appearance of activated droplets at the earth's surface is associated with the accelerating effect of descending air currents. Author

N74-33055 Israel Program for Scientific Translations, Ltd., Jerusalem.
APPLICATION OF THE STOCHASTIC APPROACH TO THE PROBLEM OF THE RADIOACTIVITY OF RAINDROPS AND CLOUD-BORNE DROPS **c13**
A. S. Avramenko *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 137-145 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

An attempt is made to apply the stochastic approach to the problem of the radioactivity of raindrops and cloud borne drops. A general system of equations is written with which to calculate the distribution function of the cloud borne drops with respect to activity for the radioactive series of natural decay products in elemental state. A steady solution is given for the case when the concentrations of the preceding elements of the radioactive series can be neglected. The obtained distribution is used to derive a relationship between the number of nonradioactive raindrops and their size. The theoretical relationships and published experimental data are in satisfactory agreement. Author

N74-33056 Israel Program for Scientific Translations, Ltd., Jerusalem.
COMPARISON OF THE CHARACTERISTICS OF HYGROSCOPIC AND NONHYGROSCOPIC AEROSOL WASHOUT BY CLOUD-BORNE DROPS **c13**
I. I. Burtsev and L. V. Burtseva *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 146-153 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

Washout by cloud borne drops of aerosol of size 0.1-0.5 micron is examined as function of its hygroscopicity. Radioactive hygroscopic (p-32)2O5 and nonhygroscopic Sr-89CO3 aerosols were investigated and their washout characteristics compared. It is shown on the basis of an experimental comparison of the characteristics of the capture of aerosol of the same disperse group, but with different physical properties, that the hygroscopicity of the aerosol substantially affects its behavior in a cloud medium. The capture efficiency of hygroscopic aerosol is twice that of nonhygroscopic aerosol. Author

N74-33057 Israel Program for Scientific Translations, Ltd., Jerusalem.
ATMOSPHERIC WASHOUT OF RADIOACTIVE CONTAMINANT IN THE MOUNTAINS OF CENTRAL CAUCASUS **c13**
A. S. Avramenko and K. P. Makhonko *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 154-165 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. No. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The coefficient sigma of radioactive dust washout from the subcloud layer of the atmosphere was determined by measuring the contaminant concentration in precipitation at two different altitudes in 1968-1969 in mountains. The mean value of sigma for the products of nuclear bursts in steady rain was 3 X 0.00001 sec/1; for showers sigma is roughly twice as large, and for snows five times as large. Measurements during steady rain for upslope and downslope winds enabled us to estimate the mean speed of the ascending air currents, found to be approximately 0.6m/sec. With increase in precipitation intensity I the value of sigma decreases rapidly at first, passes through a minimum when I approximately 1mm/hr, and then increases. It is shown that vertical air currents affect the obtained relationship. Author

N74-33058 Israel Program for Scientific Translations, Ltd., Jerusalem.
UTILIZATION OF NATURAL RADIOACTIVE SUBSTANCES IN THE STUDY OF TURBULENT EXCHANGE AND ATMOSPHERIC SCAVENGING BY MEANS OF GROUND MEASUREMENTS
V. N. Bakulin, E. E. Senko, B. G. Starikov, and V. A. Trufakin *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 166-172 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

On the basis of round-the-clock measurements of the exhalation of thoron and the concentrations of thoron and Pb-212 at heights of 1 and 5m, mean values of the growth rate of the turbulence coefficient with height in a summer anticyclone, were obtained. It is shown that these data enable one to evaluate the mean value of the turbulence coefficient in the lower km layer of the troposphere with the aid of ground measurements. Unlike thoron and Pb-212, radon cannot be considered as existing in quasi-steady conditions, and nonsteady models of its behavior in the atmosphere must be used. Near the earth, the ratio between the decay products of radon is a good indicator of the time variation in the turbulent exchange. Data are given about the washout coefficients of radioactive aerosols by precipitation on

the basis of Pb-212 (ThB), radon and Pb-210(RaD) concentration measurements. Author

N74-33059 Israel Program for Scientific Translations, Ltd., Jerusalem.
SOME FEATURES OF ATMOSPHERIC CLEANSING BY GROUND CONDENSATION
B. I. Styro and N. P. Dargene *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 173-181 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

Simultaneous measurements of the radioactivity of air and dew samples show that short lived alpha radioactivities are due to the decays of 84PO-218, 82Pb-214, and 83Bi-214, for old dew they lie in the range of (0.1 to 24.5) x 10 to the minus 11th power curie/mliter, and for the new dew in the range of (0.1 to 26) x 10 to the minus 11th power curie/mliter. The parameter of radioactive removal from the air during the fall of dew is (0.02 to 1) x 0.0001 sec/1 for old dew and (0.3 to 1) x 0.0001 sec/1 for new dew. A parabolic relationship is obtained between the specific radioactivity of new dew and the air, which points to the growth in washout intensity with increasing air radioactivity. The specific radioactivity and the coeficient of nonradioactive removal of radioactive substances by old dew was studied as a function of the amount of fallen dew. It was concluded that atmospheric cleansing occurs mainly: (1) through direct condensation of water vapor on radioactive aerosols; and (2) under the influence of electric interactions between aerosol particles and the dewdrops. Author

N74-33060 Israel Program for Scientific Translations, Ltd., Jerusalem.
RELATION BETWEEN ATMOSPHERIC PRECIPITATION WASHOUT OF RADIOACTIVITY AND NONACTIVE IONS
L. I. Piskunov and S. I. Tarasov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 182-186 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

A correlation in the form of a power relationship is assumed between the atmospheric washout of radioactive contaminants and nonactive chloride and sulfates. For a tropospheric background radioactivity, the constancy of the relation in atmospheric precipitation of the radioactivity with respect to the chlorides and the sulfates follows from their identical washout laws. On the basis of logarithmic equilibrium constants. It is possible to derive an approximate evaluation of the radioactive state of the atmosphere. To determine constants P1 and P2 one requires observations with sufficient statistics subject to the conditions of the background concentration of the contaminants. It is assumed that the absence of a correlation between dust washed out from the atmosphere, radioactive components, and the background concentration of nonactive ions can serve as an indicator of anomalous phenomena. Author

N74-33061 Israel Program for Scientific Translations, Ltd., Jerusalem.
ACCOUNTING FOR SOME NONSTEADY PROCESSES IN RECORDING NATURAL AIR RADIOACTIVITY
V. N. Bakulin and V. P. Matulyavichyus *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 187-193 refs Transl. Into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The accumulation of radon disintegration products is studied theoretically for recorders with fixed and mobile filters, for constant and linearly increasing concentration of these products in air, taking into account the relation between their concentrations. It is demonstrated that neglecting the equilibrium in the radon series can lead to an error several times greater when determining the concentration of radon and its disintegration products in air from measurements of the activity of recorder filters. A formula is proposed for determining constant concentrations of Rn and its disintegration products in air by various suction methods in relation to the degree of equilibrium in the radon series. The optimum filtration time for a recorder with a mobile filter is shown to be at most 1.5 to 2 hrs. A method is suggested for determining the relationship between radon disintegration products measured by two counters, one positioned in the path of the recorder film. Author

N74-33062 Israel Program for Scientific Translations, Ltd., Jerusalem.
COSMOGONIC SODIUM-22 AND BERYLLIUM-7 ISOTOPES IN INVESTIGATIONS OF ATMOSPHERIC DYNAMICS
V. Yu. Luyanas, R. Yu. Yasyulenis, and B. I. Styro *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 194-196 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The possibility of using the ratio of concentrations of the cosmogonic radioisotopes Na-22 and Be-7 for determining the penetration of stratospheric air to the earth's surface is considered. The measurements were carried out between 1965 and 1969. In some cases, the Na-22/Be-7 ratio reached values that were typical of stratospheric air. Author

N74-33063 Israel Program for Scientific Translations, Ltd., Jerusalem.
ARGON SPALLATION YIELDS OF COSMOGONIC RADIOISOTOPES c29
R. Yu. Yasyulenis, V. Yu. Luyanas, and B. I. Styro *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 197-200 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The rates at which cosmogonic isotopes are formed by argon spallation are evaluated. The cross sections of isotope formation are calculated from a refined Rudstam formula. The yields are given for one star of F-18, Ne-24, Na-22, Na-24, Mg-28, Al-28, Al-29, Si-31,. Si-32, P-30, P-32, P-33, S-37, Cl-34, Cl-36 and Cl-38 isotopes. The yield dependence on one star from the depth of the atmosphere is also given. Author

N74-33064 Israel Program for Scientific Translations, Ltd., Jerusalem.
LONG-LIVED ALPHA-RADIOACTIVITY IN FALLOUT AT VILNIUS AND AT VARIOUS ATLANTIC LATITUDES
B. I. Styro, N. K. Shpirkauskaite, V. N. Gasyunas, and V. M. Kuptsov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 201-207 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The isotope composition of long lived alpha radiation in atmospheric precipitation at Vilnius and at different latitudes over the Atlantic is investigated Relevant data were obtained for each 10 deg latitudinal strip between 60 deg N and 70 deg S over the Atlantic. The fallout density of long lived alpha radioactivity is described by geographical distribution with maxima at 50 to 40 deg and 20 to 30 deg N and S, and with minima at 40 to 30 deg N and S. The U-238, Th-232 and Pu-239 contents in atmospheric precipitation were measured using an alpha spectrometer with ion chamber, and their ratios were calculated. For Vilnius, the U-238 values were 0.41 to 7.33 x 0.00001 g/g, the Th-232 values were 0.014 to 7.27 x 0.000001 g/g, and the Pu-239 values were 0.04 to 3.10 x 10 to the minus 10th power g/g; over the Atlantic the values were 0.18 to 9.5 x 0.00001, 0 to (0.52-1.8) x 0.00001 and 0.06 to .37 x 10 the minus 10th power g per gram of ash residue, respectively. Author

N74-33065 Israel Program for Scientific Translations, Ltd., Jerusalem.
SEASONAL BERYLLIUM-7 VARIATIONS IN GROUND LEVEL AIR
L. I. Gedeonov, Z. G. Gritchenko, and V. M. Flegontov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 208-212 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)

CSCL 18H

The content of cosmogonic Be-7 in ground level air and atmospheric precipitation was determined from gamma radiation with the aid of a scintillation and a Ge(Li) drift Gamma spectrometer. In periods when the atmosphere was cleansed of short lived radionuclides of artificial orgin, Be-7 was determined in daily samples of atmospheric aerosols filtered from the air. It was found that Be-7 in ground level air sometimes varied tenfold from day to day. A great amount of experimental material was collected in the seven years of observations and an average curve was plotted of the mean monthly variation of Be-7 concentration in ground level air. It was thus possible to distinguish a constant and a variable component in the varation of Be-7 concentration. Be-7, continuously being formed in the troposphere, is apparently the constant component, with superimposed periodic components due to seasonal Be-7 penetration from the stratosphere, attaining great values in summer. Be-7 concentration in ground level air is highest every June, and lowest in December. Author

N74-33066 Israel Program for Scientific Translations, Ltd., Jerusalem.

CONCENTRATION OF SODIUM RADIOISOTOPES IN THE GROUND LAYER OF THE ATMOSPHERE AND IN PRECIPITATION

R. Yu. Yasyulenis, V. Yu. Luyanas, and B. I. Styro *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 213-215 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)

CSCL 18H

Measurements of sodium isotope concentrations in rainwater are reported. The sodium was extracted with KU-2 cationite. Na-22 was measured from the positronic radiation, and Na-24 from beta-gamma coincidences. The ratios of Na-22 and Na-24 concentrations in the same rainwater sample were found to be 70 and 120. The measured ratios are compared with theoretical evaluations of the concentration ratios in the air. Author

N74-33067 Israel Program for Scientific Translations, Ltd., Jerusalem.

CONCENTRATION OF PHOSPHORUS RADIOISOTOPES IN THE GROUND LAYER OF THE ATMOSPHERE AND IN PRECIPITATION

D. A. Shopauskene and V. P. Shvedov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 216-219 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)

CSCL 18H

Systematic measurements of P-32 and P-33 concentrations are reported in the areas of Vilnius, Lithuania and Cornesti (Moldavian SSR). The maximum values reached 13.8 x 10 to the minus 15th power curie/cu m for P-32 and 3.6 x 10 to the minus 15th power curie/cu m for P-33; the minima did not exceed 0.4 and 0.15 x 10 to the minus 15th power curie/cu m, respectively, in air samples taken from the ground layer of the atmosphere. The average P-32 concentration in an atmospheric precipitation was 0.47 x to the minus 12th power curie/liter at Vilnius; in samples taken from torrential rains at Cornesti the P-32 concentration reached x 10 to the minus 15th power curie/liter. Author

N74-33068 Israel Program for Scientific Translations, Ltd., Jerusalem.

RADIUM-226 IN ATMOSPHERIC PRECIPITATION, AND THE POSSIBILITIES FOR LEAD-210, BISMUTH-210 AND POLONIUM-210 TO PENETRATE THE ATMOSPHERE FROM THE EARTH'S SURFACE

V. D. Vilenskii *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 220-223 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)

CSCL 18H

The intensity of atmospheric Ra-226 and Pb-210 fallout in the Moscow area 1967 to 1969 varied between 0.08 and 1.8 micron curie/sq km day for Ra-226 and between 1 and 18.6 micron curie/sq km day for Pb-210. The ratio of Ra-226 to Pb-210 concentrations in atmospheric precipitations varied between 0.024 and 0.222, the mean annual value being 0.086. Assuming Ra-226 penetrates the atmosphere from the earth's surface along with dust, the proportions of Pb-210, Bi-210, and Po-210 penetrating the atmosphere with the dust have been evaluated along with the overall concentration if these radioisotopes in atmospheric precipitation. The natural radioactivity of atmospheric dust is shown to possible influence the proportion of isotopes used for evaluating the rate of atmospheric scavenging. Author

N74-33069 Israel Program for Scientific Translations, Ltd., Jerusalem.

POLONIUM-210 IN THE ATMOSPHERE AND ITS RATIO TO LEAD-210

S. S. Shalaveyus and B. I. Styro *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 224-231 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)

CSCL 18H

The Pb-210 and Po-210 concentrations in atmospheric air and precipitation were measured. Po-210 was determined from its alpha activity after being separated from the other alpha radiating elements by precipitation on copper. In 1966 to 1968, the Po-210 concentration in atmospheric air was 3.5 to 71.4 x 10 to the minus 16th power curie/cu m. The Po-210/Pb-210 ratio in that period fluctuated between 0.07 and 0.22; the higher values indicate that air in which Pb-210 and Po-210 has accumulated was sometimes released into the ground layer. In 1967 to 1968, the Po-210 concentration in precipitation varied between 0.2 and 1.9 x 10 to the minus 12th power curie/liter, and the Po-210/Pb-210 ratio varied between 0.1 and 0.37. An inverse correlation was found between the Po-210 concentration in precipitation and that in the atmosphere. Author

N74-33070 Israel Program for Scientific Translations, Ltd., Jerusalem.

TIME FLUCTUATIONS OF LEAD-210 CONCENTRATION IN THE GROUND LAYER OF THE ATMOSPHERE

S. G. Malakhov, V. A. Trufakin, and Z. S. Shulepko *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 232-238 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)

CSCL 18H

Data on the mean annual Pb-210 concentration in the ground layer of the atmosphere are given for various points in the world. This concentration varies between 10 to the minus 14th and 10 to the minus 15th power curie/cu m deep inland, 1 and 2 x 10 to the minus 15th power curie/cu m over the oceans in the Northern Hemisphere, and equals 10 to the minus 16th power curie/cu m in the polar areas of both hemispheres. Measurements in the Antarctic have revealed seasonal variations with a maximum in summer. Short term fluctuations are studied and assessed from measurements around Kirov. It is shown that cold air advection from the Arctic usually reduces considerably the Pb-210 concentration. Author

N74-33071 Israel Program for Scientific Translations, Ltd., Jerusalem.

ASSESSMENT OF RADON EMANATION FROM THE SURFACE OF EXTENSIVE TERRITORIES

T. I. Sisigina *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 239-244 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)

CSCL 18H

A method of assessing radon emanation from a surface covered by one type of soil is elaborated. Measurements of the flux density of radon from the soil surface into the atmosphere, of radon concentration in the soil profile to a depth of 2 m, emanation factors and radium content in the soil, and of soil porosity and water content show a correlation between radium content in the surface soil layer and radon emanation into the ground layer of the atmosphere. A specific emanation factor beta, i.e., the radon flux density due to unit radium concentration in the soil, is calculated from measurements at different points,

but on soils of similar mechanical composition, and diverges 8 to 10% from its average value for the given soil type. For the territory bounded by the latitude of Leningrad to the north and the Northern Caucasus foothills to the south, the weighted mean radon flux density into the atmosphere is 24 x 10 to the minus 8th power curie/sq km sec. Author

N74-33072 Israel Program for Scientific Translations, Ltd., Jerusalem.
FILTERING AEROSOLS WITH NATURAL ATMOSPHERIC RADIOACTIVITY THROUGH FIBROUS MATERIALS c14
B. I. Ogorodnikov, V. I. Skitovich, and E. A. Sitalo *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 245-254 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

At a filtration rate of about 150 cm/sec FPP-15 and FPA-15 materials have approximately the same efficiency, but the former is more effective at a rate of about 1 to 10 cm/sec owing to the presence of electrostatic charges on its fibers. FP material is suitable for use in the upper atmosphere, as its efficiency in trapping aerosols of all sizes increases. For instance, the efficiency of FPA-15 material in trapping aerosols of about 0.035 micron particle radius at filtration rates of 1 to 65 cm/sec is approximately 10 to 12 times as high at 27 km as at ground level. A study of radioactivity distribution over the layers of the filtering material has shown that particles of that size account for 40 to 60% of the radioactivity of radon daughter products in the ground layer of the atmosphere. EP filtering was studied experimentally with air containing coarse aerosols and with practically pure air containing a large amount of free atomic Ra daughter products. The free products filter with very high efficiency with a high diffusion coefficient, even at rates of 300 cm/sec. Author

N74-33073 Israel Program for Scientific Translations, Ltd., Jerusalem.
DEVELOPMENT OF A METHOD FOR DETERMINING THE SIZE DISTRIBUTION OF RADIOACTIVE AEROSOLS WITH THE AID OF FILTERING MATERIALS c24
B. I. Ogorodnikov, E. A. Sitalo, V. I. Skitovich, and I. E. Konstantinov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 255-258 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The efficiency of aerosol trapping by fibrous FP filtering materials depends on the rate of filtration, the diameters of the aerosol particles and of the filter fibers, and the thickness of the filtering layer. The filtering characteristics of FPP-3, FPP-70 and FPA-100 materials were determined with aerosols of 0.035 to 0.5 micron particle radius. Linear filtration rates of about 1.5 to 2.0 m/sec were found to be adequate for investigating the size distribution of artificial radioactive aerosols, when the aerosols are mainly trapped by inertial effect. In this case, if FPP-70-0.3 material is used in the front layer and FPP-3-1.2 in the rear, the first filter retains over 95% of the aerosol particles of 0.5 micron radius and less than 20% of the particles of about 0.035 micron radius. The latter are practically all trapped by the rear filter. Various combinations of layers of FPP-70 and FPP-3 filtering materials were tested while taking radioactive aerosol samples at filtration rates of 1.0 to 1.6 m/sec. Much of the Zr-95, Cs-137 and Be-7 is bound to particles of 0.2 to 0.25 micron average radius. For all isotopes, at least 10% of the overall activity is carried by particles below 0.1 micron. Author

N74-33074 Israel Program for Scientific Translations, Ltd., Jerusalem.
PRELIMINARY DATA ON THE MEASUREMENT OF THE ATMOSPHERIC AEROSOL CHARACTERISTICS WITH A CENTRIFUGAL SPECTROMETER c14
Yu. N. Redkin *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 259-272 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

An aerosol spectrometer is reported that makes it possible to obtain continuous spectra of particles for Stokes radii R sub s between 0.4 and 10 micron. A relationship whose log-log plat for particles with R sub s much greater than 0.0001 is almost a straight line is derived from the equation of particle motion in a viscous space for a rotating system of coordinates where the angle of particle deviation from a radius passes through the point from which the particle starts moving. The spectrometer model was built as a hollow, rotating steel disk, through the axis of which aerosols are pumped. Owing to centrifugal sedimentation, part of the dust penetrates special slots to form a pencil of rays splitting more and more as the particles move away from the axis of rotation. The coarser the particle, the larger the angle of its deviation. A theoretical evaluation of the efficiency of this device showed it to depend very little on particle size. Author

N74-33075 Israel Program for Scientific Translations, Ltd., Jerusalem.
MEASURING THE CONCENTRATION OF HIGHLY-DISPERSE RADIOACTIVE AEROSOLS BY THE DIFFUSION METHOD
S. V. Kolerskii, Yu. V. Kuznetsov, S. O. Lekhtmakher, N. M. Polev, L. S. Ruzer, and S. A. Stoyanova *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 273-278 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The application of the diffusion method is reported for the determination of the proportion of free atoms and of all the ultrahighly disperse aerosols (molecular complexes) formed through interaction of free atoms with the molecules of the various gases in the air, and for the overall concentration of radioactive aerosols of emanation daughter products in air. The coefficient of deposition of ultrahighly disperse particles in a cylindrical channel is shown to be affected by an error of 3 to 5% at most, due to the fact that the variable distribution of flow velocities in the inflow section of the channel is disregarded in the formulas. The errors of the method are discussed, and the method is shown to facilitate reliable measurements of the proportion of ultrahighly disperse radioactive aerosols of emanation daughter products, if this proportion is at least 10 to 20%. Author

N74-33076 Israel Program for Scientific Translations, Ltd., Jerusalem.
SEPARATE DETERMINATION OF Rn, RaA, RaB AND RaC CONCENTRATIONS IN AIR FROM THE ALPHA-ACTIVITY DECAY CURVE OF A FILTER c24
V. N. Bakulin and B. G. Starikov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 279-285 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The relationships between radon and its decay products are of interest when studying turbulent agitation and contaminant washout processes in the lower troposphere. An examination of the different methods of separate determination of the concentrations of radon daughter products shows that only some of them yield satisfactory results at low atmospheric concentrations of radon. An analytical analog has been developed of the graphical method of separate determination of Po-218, Pb-274 and Bi-214 concentrations from the curve of filter alpha activity decay; the analog is as accurate as the least squares method for three unknowns, but the calculations are incomparably simpler. A comparison of these methods for known proportions of the radon decay products proved the adequacy of the proposed method. The existence of standard proportions between the short lived radon decay products under natural conditions was demonstrated; they make it possible to determine the concentration of each of them from the alpha decay curve within 11 to 60 min from the end of filtration. Author

N74-33077 Israel Program for Scientific Translations, Ltd., Jerusalem.
NEW METHODS OF MEASURING Rn-220 (THORON) EXHALATION AND SOME RESULTS c24

B. I. Styro, T. N. Nedvetskaite, and E. E. Senko *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 286-292 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

Two new methods are proposed for the measurement of exhalation. One uses a Pearson collector combined with a decay chamber for radioactive emanations. In the other, the Pearson collector is replaced by an accumulation chamber connected to three auxiliary decay chambers through which the air flows in from the surrounding space with already decaying Rn-220. After passing through the decay chamber, the Rn-220 and Rn-222 daughter products formed there were trapped on an LFS-1 filter which, after 6 hours of Rn-222 daughter products decay, was brought into contact with an A-2 nuclear emulsion. The setups were calibrated with Th-232 salt which was in equilibrium with the decay products. Since the calibration coefficient at low sampling rates fluctuated between 2 and 5%, the air penetrating the decay chamber was ionized by corona discharge, which increased up to fifteen fold the filter's aerosol trapping efficiency. The use of corona discharge and nuclear emulsions helped considerably in raising the lower sensitivity limit of Rn-220 exhalation measurements. The error of Rn-220 exhalation measurement by these two methods does not exceed 20%. Data are provided on the diurnal variation in Rn-220 exhalation and mean exhalation values for various states of the earth's surface.
Author

N74-33078 Israel Program for Scientific Translations, Ltd., Jerusalem.
A SIMPLE TWO-DIMENSIONAL ANALYZER OF BETA-GAMMA COINCIDENCES IN THE STUDY OF RADIOACTIVE FALLOUT SAMPLES **c14**
E. F. Kovnatskii, E. I. Roslyi, and A. N. Silantev *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 293-296 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

A two dimensional analyzer of beta-gamma coincidences is described that is based on two commercial AI-100 analyzers. The setup facilitates the recording of coincidence spectra during the measurement on a punch tape on which are recorded, at the end of the measurement, the beta and gamma spectra picked up by a single crystal spectrometer. A functional circuit of the setup and a diagram of the control unit are also given. Author

N74-33079 Israel Program for Scientific Translations, Ltd., Jerusalem.
SPECTROMETRIC METHOD OF MEASURING THE CONCENTRATION OF NATURAL RADIOACTIVE AEROSOLS **c14**
V. G. Labushkin, V. I. Popov, and L. S. Ruzer *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 297-309 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

A spectrometric method is discussed for determining the concentration of natural atmospheric radioactive aerosols formed by radon and thoron decay daughter products. The determination of radon daughter product concentrations is accompanied by measurement of the alpha and beta activity of the disperse phase of aerosols deposited on a fine fibered LFS-1 filter by means of scintillation spectrometric detection units. For a simultaneous measurement of the concentration of daughter products of both radon and thoron, a spectrometric unit for the detection of alpha radiation, composed of a 0.3 to 0.4 mm thick CsI(Tl) crystal of 63 mm diameter and a FEU-52 photomultiplier is used. It is demonstrated that the adoption of these spectroscopic methods considerably reduces the error and facilitates determination of the self-absorption of alpha radiation in the aerosol sample and the dust content of the air.
Author

N74-33080 Israel Program for Scientific Translations, Ltd., Jerusalem.
ISOTOPE ANALYSIS OF RADIOACTIVE FALLOUT AND AEROSOL SAMPLES BY BETA-SPECTROMETRY **c14**
A. N. Silantev, T. V. Polyakova, F. A. Rabotnova, and I. G. Shruratova *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 310-314 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

A method is discussed for determining the content of radium-106, praseodymium-144, yttrium-90 and strontium-89 isotopes by beta spectrometric analysis, involving the use of a scintillation beta spectrometer with a plastic 20-mm thick scintillator of 70-mm diameter. Only beta radiation of energies above 630 keV is taken into account when processing spectra. The measured spectra in the range of 630 keV to 3.5 MeV are subdivided into intervals and the transition from the number of pulses recorded to the activity of the isotopes is expressed by a formula.
Author

N74-33081 Israel Program for Scientific Translations, Ltd., Jerusalem.
RAPID SYSTEM OF AUTOMATIC PUNCH-TAPE OUTPUT OF INFORMATION FROM THE AI-100-1 ANALYZER **c14**
N. F. Mazurin, V. P. Solovev, and V. N. Churkin *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 315-318 ref Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The SAPAR-1m system is described for automatic punch tape output of information from a multichannel amplitude analyzer of pulses in the code of the Minsk-2 or Minsk-22 computer. The block diagram of the system includes an AU-100-1 analyzer, a code-conversion and puncher control circuit, and a PL-80 tape puncher. In contrast to earlier setups, the code conversion and puncher control circuit is transistorized, and thus faster and more reliable. The top speed of the SAPAR-1m entirely depends on the top speed of the puncher: with the PL-800 puncher, it attains 12 channels per second. Automatic punching of measurement data, combined with machine processing of amplitude spectra on the Minsk-22 computer, has almost completely eliminated manual operations from gramma spectrum processing.
Author

N74-33082 Israel Program for Scientific Translations, Ltd., Jerusalem.
GRAPHOANALYTICAL METHOD FOR DETERMINING CESIUM-137 CONCENTRATION IN SOIL SAMPLES FROM THE GAMMA SPECTRUM **c13**
V. N. Churkin *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 319-334 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The high energy part of the amplitude distribution of pulses in the region of the Cs-137 photopeak of 680 to 740 keV is shown to be fairly well approximated by a Gaussian curve, if the Cs-137 photopeak in the gamma spectrum of soil samples is separated from the right hand base of the curve parallel to the level of the natural background. This facilitates graphoanalytical determination of the Cs-137 photopeak area along with calculation of the concentration of this isotope in the soil. Components due to interfering radiation of natural and artificial isotopes need not be taken into account. The threshold sensitivity for a 50% statistical error of measurement is 12 x 10 to the minus 13th power curie/g. The method is five to eight times as efficient as known methods.
Author

N74-33083 Israel Program for Scientific Translations, Ltd., Jerusalem.
RADIOCHEMICAL METHOD OF DETERMINING LOW STRONTIUM-90 CONCENTRATION LEVELS IN ENVIRONMENTAL SAMPLES **c13**
V. B. Chumichev *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 335-339 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

A radiochemical method for determining Sr-90 in 10 liters

of seawater is described in detail. It involves a low background radiometric setup intended for measuring the beta radiation of the daughter Y-90. The method significantly facilitates the taking and preliminary processing of seawater samples, reduces the consumption of reagents such as soda and hydrochloric acid, eliminates the use of ammonium chloride, and increases the relative yield of strontium. Analysis of the carbonate concentrate becomes three times as efficient as analysis of the concentrate from a 100-liter sample. Sr-90 can be determined in 2-liter seawater samples without a flame photometer. The method is also used to study the sea bottom at Sr-90 concentration levels of 10 to the 12th power curie. Author

N74-33084 Israel Program for Scientific Translations, Ltd., Jerusalem.
FALLOUT AND ACCUMULATION OF RADIOACTIVE DECAY PRODUCTS IN 1966 - 1968 IN THE VICINITY OF LENINGRAD
N. V. Vasileva, L. I. Gedeonov, Z. G. Gritchenko, M. I. Zhilkina, and V. M. Flegontov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 340-346 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

Isotope compositions for global radioactive fallout 1966 to 1968 in the Leningrad region, the fallout density of radioactive fission products, and the amount of radioactive products deposited on the ground surface at observation point, are reported. Ce-141, Ru-103 and Zr-95 were recorded in the ground layer of the atmosphere and in atmospheric precipitation. Longer lived radionuclides such as Ce-144 and Ru-106, mostly penetrating from the stratospheric source of radioactive contamination, contributed in 1968 much to the overall proportion of total beta activity. Based on an analysis of the activity ratio of short lived radionuclides to long lived ones, the global radioactive fallout in the Leningrad district is shown to be due almost entirely to later nuclear explosions. At the end of 1968, the accumulated activity of total beta radioactive fission products was approximately 0.35 curie/sq km; that of Ce-155 + Pr-144 was approximately 13 mcurie/sq km, of Rn-105 approximately 6 mcurie/sq km, of Zr-95 + Nb-95 approximately 0.55 mcurie/sq km, and that of Ce-141 was below 0.1 mcurie/sq km. Author

N74-33085 Israel Program for Scientific Translations, Ltd., Jerusalem.
PENETRATION OF RADIOACTIVE FISSION PRODUCTS FROM 1964 - 1967 NUCLEAR TESTS INTO THE GROUND LAYER OF THE ATMOSPHERE IN THE LENINGRAD AREA
L. I. Gedeonov, Z. G. Gritchenko, and V. M. Flegontov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 347-352 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

Radioactive fission products formed during tests of nuclear weapons were recorded in 1964 to 1968 in the ground layer of the atmosphere in the Leningrad area. The following radioactive isotopes were determined with the aid of a scintillation and a Ge(Li) drift gamma spectrometer in radioactive aerosols filtered out of the ground layer of atmospheric air: Ba-140, La-140, Ce-141, Ru-103, Zr-95, Nb-95, Ce-144, Ru-106, and Cs-137. The forming of these radioactive fission products was dated from the activity ratios of the following pairs of radionuclides: Ba-140/Ce-141, Ce-141/Zr-95, Ce-141/Ce-144, Zr-95/Ce-144, and Ce-144/Cs-137. Author

N74-33086 Israel Program for Scientific Translations, Ltd., Jerusalem.
STUDY OF THE RESISTANCE OF FIBROUS FILTERING MATERIALS IN RAREFIED AIR c18
I. V. Petryanov, B. I. Ogorodnikov, and L. A. Zimina *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 353-357 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

The resistance of fibrous FP filtering materials in a flow of rarefied air is studied. The material resistance was found to decrease with increasing length of the mean free paths of the gas molecules, because the gas flow glides along the filter fibers, and at normal atmospheric pressure the resistance of almost all FP materials is already lower than its maximum. For FPP-5, LFS-2 and FPP-15 materials, which consist of ultrafine fibers, the loss of resistance is 10-20%. Higher compaction leads to a slight additional drop in resistance from the maximum for the given compaction. Author

N74-33087 Israel Program for Scientific Translations, Ltd., Jerusalem.
VERTICAL DISTRIBUTION OF THE CONCENTRATION OF RADON DECAY PRODUCTS IN THE 0-300-m LAYER c13
L. V. Kirichenko and S. G. Malakhov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 358-360 ref Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

Data on the vertical distribution of the concentration of radon decay products in the 0 to 300-m layer of the atmosphere are provided. The measurements were carried out in August 1961 on the Obninsk altitude tower of the Institute of Experimental Meteorology. During daytime, the concentration of radon decay products remains practically constant throughout the layer. In the evening and at night it drops rapidly with increasing altitude from the ground surface up to a height of 50 to 75 m. Author

N74-33088 Israel Program for Scientific Translations, Ltd., Jerusalem.
NATURAL SNOWFLAKE RADIOACTIVITY DUE TO SHORT-LIVED RADON DECAY PRODUCTS
A. S. Avramenko and K. P. Makhonko *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 361-371 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

Snowflake radioactivity due to short lived products of radon decay is discussed. Nuclear photoplates of the A-2 type were used as indicator. Of the 3,106 snowflakes measured, 1,270 were radioactive. The frequency of the specific radioactivity of snow flakes has two maxima, at C = 0 and at C = 16 to 32 x 7,000 alpha tracks per gram, and one minimum at C = 4 to 8 x 1,000 alpha tracks per gram. The number of nonradioactive snowflakes and the specific snowflake radioactivity decreased with increased snowflake mass. A scheme for the radioactivation of snowflakes in order to examine the patterns obtained is also discussed. The coagulation constant of radioactive aerosols with the cloud elements is assessed from experimental data on the number of nonradioactive snowflakes. Author

N74-33089 Israel Program for Scientific Translations, Ltd., Jerusalem.
TRACE ELEMENTS AND NATURAL RADIOACTIVITY IN CLOUD WATER AND ATMOSPHERIC PRECIPITATION IN THE CENTRAL CAUCASUS MOUNTAINS
K. P. Makhonko, A. S. Avramenko, and K. P. Makhonko *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 372-379 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

Total concentrations of short lived radon decay products in precipitation, cloud water and air were measured in summer on the Terskol peak of the Central Caucasus, along with the concentrations of Fe, Pb, Mn, Ni, and Mg. The precipitation samples were taken in polyethylene vessels, the cloud water samples were taken with the aid of a battery of four parallel cyclones, while the atmospheric aerosol samples were taken by means of a filtering setup with an EPP-15-1.5 filter. The admixture concentrations obtained are similar in the precipitation and the cloud water, as are the corresponding coefficients of admixture concentration (concentration ratios of water to air), i.e., the contamination of precipitation takes place mainly in the cloud. The assessed lifetimes of the trace elements in the atmospheric

layer subjected to precipitation washout, concentration coefficient, and rate of wet precipitation correspond approximately to the values for natural radioactivity, and with literature data for macroelements and nuclear explosion products. Author

N74-33090# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
MOTOR VEHICLE EMISSION ESTIMATION Interim Report
David S. Kircher and Donald P. Armstrong Oct. 1973 43 p refs
(PB-230931/8; EPA-450/2-73-003) Avail: NTIS HC $5.25 CSCL 13B

New gasoline powered motor vehicle (light-duty and heavy-duty) emission factors for carbon monoxide, hydrocarbons, and nitrogen oxides, are presented based on a recent nation-wide study of over 1,000 automobiles. These factors account for such variables as the model year, deterioration, and average speed differences. Sample calculations are included to illustrate the method of obtaining emission factors that are most representative of a particular region, vehicle mix (age and type), and average speed. Methods are given for obtaining estimates to area-wide (region or subregion) emissions attributed to gasoline powered vehicles. GRA

N74-33091# Environmental Protection Agency, Research Triangle Park, N.C. Monitoring and Data Analysis Div.
DIRECTORY OF AIR QUALITY MONITORING SITES, 1972
Sep. 1973 799 p
(PB-231003/5; EPA-450/2-73-006) Avail: NTIS HC $15.00 CSCL 13B

The Environmental Protection Agency (EPA) operated the National Aerometric Data Bank for the storage, summary, and retrieval of aerometric data. Data are submitted to EPA from local, state, and Federal air pollution control agencies as well as a limited number of private institutions. This publication included a listing of all monitoring sites which have submitted a SAROAD (Storage and Retrieval of Aerometric Data) Site Identification Form. The SAROAD site code identifies the sampling sit location and is assigned by EPA. It identifies the following: state; county, parish or air pollution district in the state; particular site within the city or county; type agency responsible for the sample analysis; and type of project being conducted at the site. The directory contains a computer listing of all site information currently stored in the National Aerometric Data Bank. GRA

N74-33092# Environmental Protection Agency, Research Triangle Park, N.C. Emission Standards and Engineering Div.
FLUE GAS DESULFURIZATION: ANSWERS TO BASIC QUESTIONS
Oct. 1973 18 p
(PB-231005/0; EPA-450/9-73-001) Avail: NTIS HC $4.00 CSCL 13B

The purpose of this publication is to provide a better understanding of flue gas desulfurization. It provides brief answers to questions concerning its applicability, cost, effectiveness, and operation. GRA

N74-33093# Battelle Columbus Labs., Ohio.
HAZE FORMATION: IT'S NATURE AND ORIGIN, 1973 Technical Report, Jun. 1972 - Jun. 1973
D. F. Miller, W. E. Schwartz, P. W. Jones, D. W. Joseph, C. W. Spicer, C. J. Riggle, and A. Levy Jun. 1973 160 p refs
(Contract EPA-68-02-0276)
(PB-231535/6; CRC-APRAC-CAPA-6-68-4) Avail: NTIS HC $5.00 CSCL 13B

The report covers field sampling and aerosol analyses of haze formation: its nature and origin. Field sampling was conducted in downtown Columbus during the latter half of July 1972, in New York City (Welfare Island) throughout August, and in Pomona, California, for 10 days in mid-November. The sampling involved continuous monitoring of the meteorological conditions and the gas-phase composition of the air concomitant with collecting aerosols and measuring visibility reduction due to light scattering. Samplers were equipped with size-fractionating devices which provided particle separation near 2 um diameter. An analytical sheme was developed for determining the organic features of aerosols. The scheme not only provides qualitative information but also numerical data. Inorganic analyses were performed on aerosols. GRA

N74-33094# General Dynamics/Convair, San Diego, Calif.
REMOTE SENSING OF AIR POLLUTION IN URBAN AREAS Environmental Protection Technology Series.
M. L. Streiff and C. B. Ludwig Aug. 1973 184 p refs
(Contract EPA-68-02-0020)
(PB-230885/6; EPA-650/2-73-026) Avail: NTIS HC $12.25 CSCL 13B

Remote sensing of air pollution was made using a scanning spectrometer (ROSE system) and a Michelson interferometer. Both systems were for transmission measurements over nominal path lengths of one and two miles and for stack emission measurements. A comparison shows that the spectra of both instruments are of the same quality. A comparison of both instruments is made and the advantages and disadvantages are cited. The ROSE system alone was used to measure the pollution from an extended source (oil refinery) over a path length of 1.4 mile. All of the spectra were analyzed and a number of pollutants were identified. Author (GRA)

N74-33095# Nevada Univ., Reno. Desert Research Inst.
PROJECT SKYWATER Supplementary Final Report, 1 Jul. 1972 - 30 Sep. 1973
1973 155 p
(Contract DI-14-06-D-6632-1968)
(PB-231460/7) Avail: NTIS HC $10.75 CSCL 04B

As the primary source of water for much of Nevada and California, the winter storms which bring moist Pacific air over the central Sierra Nevada mountain range have been studied intensively over the past few years. The data acquisition systems and reduction procedures used in the present study are described, with particular emphasis on the systems aboard the instrumented B-26 aircraft. With a goal of determining the structure and organization of the winter storms, the data from six specific storms are presented in detail. It is shown that while there is much variability between the different storms, there is nevertheless a tendency for the higher liquid water contents to occur at low levels along the western edge and over the main crest in all the storms studied. Author (GRA)

N74-33096# Army Land Warfare Lab., Aberdeen Proving Ground, Md.
EVALUATION OF THE USALWL (US ARMY LAND WARFARE LABORATORY) WEATHER KIT Final Report
M. J. Wargovich May 1974 44 p
(AD-780745; LWL-TR-74-80) Avail: NTIS CSCL 04/2

A small, compact, lightweight weather kit that can be carried on an individual's belt was developed. The kit can be used by untrained personnel after brief familiarization with the operating instructions. Kits were evaluated for field use. The components of the weather kit are the following: Sling psychrometer to measure relative humidity; Thermometer; Barometer/altimeter; Compass; Wind direction indicator; Wind speed meter; Rain gauge, and Water vial. GRA

N74-33097# Weather Wing (6th), Eglin AFB, Fla. Detachment 10 Detachment 10.
VERIFICATION OF RAINFALL ESTIMATES: AN ANALYSIS OF ACTIVATION PATTERNS OF ADSID AND ACOUSID SEISMIC AND ACOUSTIC INTRUSION SENSORS TO DETERMINE RAINFALL RATES Final Report
Donald H. Kampwerth and Richard A. Rasmussen Feb. 1974 41 p refs
(AD-781053; AWS-TR-74-253) Avail: NTIS CSCL 04/2

A test was conducted at Eglin AFB, Florida in the Fall of 1972 to verify rainfall rates as determined from the activation patterns of seismic and acoustic intrusion sensors. Sensor activations were recorded, analyzed, and compared with rainfall rates as determined from recording rain gauges collocated with the sensor strings. Useful comparison data were obtained on nine tests, as definite sensor activation patterns were correlated with various rainfall rates. Scatter diagrams were prepared and analyzed to summarize the sensor activation/rainfall rate comparison. Author (GRA)

N74-33098# Scripps Institution of Oceanography, La Jolla, Calif. Advanced Ocean Engineering Lab.
ATMOSPHERIC BOUNDARY LAYER MEASUREMENTS FROM AN OCEANIC RESEARCH TOWER Final Report, 1 Apr. 1972 - 31 Dec. 1973
J. T. Park Dec. 1973 31 p refs
(Contract N00014-69-A-0200-6039; NR 260-105)
(AD-780900; AOEL-57; SIO-Ref-74-9) Avail: NTIS CSCL 04/2

Preliminary fine-scale measurements of temperature, velocity, and their derivatives in the atmosphere have been completed on a U.S. Navy oceanographic research tower. The spectra and probability density functions are similar to those of previous investigators. Special techniques have been developed for the calibration of velocity and temperature in the field. GRA

N74-33099# Texas A&M Univ., College Station. Dept. of Oceanography and Meteorology.
PREDICTION OF ENVIRONMENTAL PARAMETERS Final Report
William H. Clayton May 1974 50 p refs
(Contract DAAB07-68-C-0073)
(AD-780913; A/M-Ref-74-2-F; ECOM-0073-F-68) Avail: NTIS CSCL 04/2

Project Themis, scheduled to terminate in September 1972, was granted an extension without additional funding through September 1973, in order to permit orderly termination of on-going research and particularly so for graduate student efforts involving theses and dissertation preparations. Inasmuch as these research efforts have all been reported in separate technical reports, the scope of this final report on Project Themis will be limited to a brief summary of the major research tasks pursued and previously reported, as well as some additional activities conducted during the final year. Author (GRA)

N74-33100# Weather Squadron (12th), Ent AFB, Colo.
MAP TYPE CATALOG FOR THE ALABAMA WINDOW
Robert C. Sabin, Richard L. Nieman, and Hal W. Wold May 1974 172 p refs
(AD-780572; Rept-12WS-TP-74-5) Avail: NTIS CSCL 04/2

A standardized procedure has been developed to determine the synoptic map types which have occurred over a specified area (window). The map type catalog is a summarization of information relating to these map types for a particular window. (There is a catalog for each of the 14 windows which cover the United States.) The catalog includes characteristics of the map types and listings of each map in the data base (25 years of surface pressure maps) along with its most similar map type for the Alabama window. GRA

N74-33101# National Climatic Center, Asheville, N.C.
US NAVAL WEATHER SERVICE COMMAND SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS, EAST AFRICAN AND SELECTED ISLAND COASTAL AREAS. VOLUME 4: AREA 19, KENYA; AREA 20, ZANZIBAR; AREA 21, TANZANIA COAST SE, AREA 22, PORTO AMELIA; AREA 23, LUMBO; AREA 24, MOZAMBIQUE CHANNEL NW; AREA 25, MOZAMBIQUE CHANNEL SW
Jun. 1974 565 p
(AD-780667) Avail: NTIS CSCL 04/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSED Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. GRA

N74-33102# RAND Corp., Santa Monica, Calif.
THE RAND WEATHER DATA BANK (RAWDAB): AN EVOLVING BASE OF ACCESSIBLE WEATHER DATA
Esperanza Rodriguez and Ralph E. Huschke Mar. 1974 154 p refs
(Contract F44620-73-C-0011)
(AD-780637; R-1269-PR) Avail: NTIS CSCL 04/2

The Rand Weather Data Bank was designed to meet the demand for realistic weather inputs to studies of defense operations and defense systems that can be influenced by weather conditions. It files--in a uniform format--the observations taken at selected stations around the globe and over periods of years up to nineteen. The information is intensive: up to 50 basic weather elements are extracted or computed from a single weather observation. This data base contains weather information from over 47 million observations; the average size of the files (one file per station) is 57,500 records (one record per weather observation). Flow charts and one of the programs for the conversion of the data into standard format are presented, as well as tables specifying the present content of this still growing data bank. Author (GRA)

N74-33103# Air Weather Service, Scott AFB, Ill.
A HISTORY OF AIR WEATHER SERVICE: WEATHER MODIFICATION 1965-1973
Henry A. Chary Jun. 1974 31 p refs
(AD-781837; AWS-TR-74-247) Avail: NTIS CSCL 04/2

Starting in 1965 with cakes of dry ice suspended from balloons, then testing vented liquid carbon dioxide, vented liquid propane, and silver iodide AWS gradually developed a ground based cold fog dissipation system. Three such systems, all using vented propane, are now operational. In 1967 AWS undertook airborne dissipation of cold fog by seeding with crusted dry ice. AWS investigations into warm fog dissipation started in 1968 when jet engines were used to clear warm fog temporarily from the Travis AFB runway. Subsequently several tests were run using hygroscopics and helicopter downwash. No operational warm fog dissipation system has yet evolved from these early works. Twice AWS has tried to alleviate the ice fog problem, but both endeavors failed to generate the desired clearings. Precipitation augmentation for drought relief is a twice used AWS capability. AWS has participated in such programs in the Philippines and in Texas. AWS's current operational weather modification capabilities include airborne and ground based cold fog dissipation and precipitation augmentation. Author (GRA)

N74-33104# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDYING THE SPECTRAL PROPERTIES OF PROGNOSTIC FIELDS FOR FINITE-DIFFERENCE ATMOSPHERE MODELS THROUGH COMPLETE EQUATIONS
M. S. Fuks-Rabinovich and S. M. Sharinova 24 Jun. 1974 17 p refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauchno-Issled. Tsentr SSSR (Leningrad), Nr. 100, 1972 p 46-54
(AD-781655; FTD-HT-23-1196-74) Avail: NTIS CSCL 04/2

Spectral analysis data for models in complete hydrothermodynamic equations, in which a large wave is compared to filtered models, are evaluated for their accuracy in formulating prognostic and circulation models of the atmosphere. Computer aided analysis was used for prognostic fields calculated by means of two finite-difference (baroclinic and barotropic) models. A.A.D.

N74-33105# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
WAYS OF DEVELOPING HYDRODYNAMIC METHODS OF WEATHER FORECASTING
G. I. Marchuk 18 Jun. 1974 14 p Transl. into ENGLISH from the book "Proceedings of the 5th All-Union Meteorological Conference" Leningrad, Glavnoe Upravlenie Gidrometeorologicheskoi Sluzhby, v. 1, 1972 p 90-96
(FTD Proj. T74-01-19)
(AD-781665; FTD-HT-23-1162-74) Avail: NTIS CSCL 04/2

Contents: Theory and methods of weather forecasting; Physics of the atmosphere; Climate and overall circulation of the atmosphere; Objective analysis and meteorological information. GRA

N74-33106# Naval Postgraduate School, Monterey, Calif.
SOLVING THE LINEAR BALANCE EQUATION GLOBALLY Preliminary Report, 1 Apr. - 30 Jun. 1974
Craig Comstock Jun. 1974 12 p refs
(zf61512001)
(AD-781362; NPS-53ZK74061) Avail: NTIS CSCL 04/2

The linear balance equation, which is used in meteorology to relate the geopotential phi and the stream function psi, is studied. The analytic solutions to the homogeneous equation are analyzed and shown to have singularities which influence numerical integration. A new approach, using finite elements, is proposed. Author (GRA)

N74-33107# Army Electronics Command, Fort Monmouth, N.J.
EVALUATION OF SEVERAL WIRE MESH SCREENS FOR THE PROTECTION AND VENTILATION OF METEOROLOGICAL SENSORS
Robert A. Diderich, Kenneth M. Barnett, and Ronald M. Cionco May 1974 22 p refs
(AD-781504; ECOM-5542) Avail: NTIS CSCL 04/2

The report contains information concerning tests of the ventilation of a screen device for the protection of meteorological sensors which are proposed for use at a remote atmospheric observation station in a desert climate. The objective of the study is to find an optimum screen which provides sufficient ventilation for good accuracy, but still adequately protects the sensor against airborne blowing dust, sand, and gravel native to White Sands Missile Range. (Modified author abstract) GRA

N74-33108# GEOMET, Inc., Rockville, Md.
VALIDATION STUDY OF A TWO DIMENSIONAL WARM FOG MODIFICATION MODEL Final Report
Demetrios J. Moshandreas 17 May 1974 36 p refs
(Contract N00014-71-C-0271; NR Proj. 082-253)
(AD-779880; GEOMET-EF-321) Avail: NTIS CSCL 04/2

The objective of the project is to perform the necessary research to investigate the validity and/or the range of applicability of the GEOMET two dimensional warm fog modification model. This validation project is to be conducted on the basis of existing results of the two dimensional model and published data from field and chamber experiments. The analysis and classification of the regular tasks involved in a warm fog modification operational use project will be investigated. GRA

N74-33109# Army Missile Command, Redstone Arsenal, Ala.
ON SPATIAL DISTRIBUTION OF VISIBILITY AND CLOUDS IN CENTRAL EUROPE
Oskar M. Essenwanger 28 Dec. 1973 64 p refs
(DA Proj. 1T1-61102-B-53A)
(AD-780723; RR-73-10) Avail: NTIS CSCL 04/2

Adverse weather conditions as defined by joint occurrence of low visibility and low ceiling have been investigated for area of Central Europe. The thresholds of adverse conditions are defined in detail in this report. The ultimate goal was the assessment of probabilities for the occurrence of adverse weather in Central Europe. Details of contingency tables for visibility versus ceiling for 14 individual stations in Central Europe up to the joint probabilities of six stations are tabulated and discussed. (Modified author abstract) GRA

N74-33110# Army Foreign Science and Technology Center, Charlottesville, Va.
FAST-RESPONSE RADIOMETER AND ANALYSIS OF A MERCURY-ALLOYED GERMANIUM RADIATION RECEIVER
Yu. A. R. Mullamaa 12 Apr. 1974 20 p Transl. into ENGLISH from Mono. Stokhasticheskaya Struktura Polei Oblachnosti i Radiatsii, Tartu (USSR), 1972 p 55-70
(AD-781028; FSTC-HT-124-74) Avail: NTIS CSCL 04/1

A fast-response radiometer-pyrometer for measuring low-level fluctuations in radiation temperature or brightness of natural formations, including clouds, is described. The effect of unmodulated radiation on receiver parameters is discussed. GRA

N74-33111# Environmental Prediction Research Facility (Navy), Monterey, Calif.
A NUMERICAL STUDY OF CLEARING WARM FOG BY USING HYGROSCOPE SEEDING IN CONJUCTION WITH HELICOPTER DOWNWASH
Paul M. Tag May 1974 43 p refs
(AD-781259; ENVPREDRSCHF-TECH-PAPER-7-7421) Avail: NTIS CSCL 04/2

Several techniques for dissipating warm fog have been tried in field experimentation. In an attempt to augment helicopter downwash dissipation efforts, hygroscopic seeding has been suggested. However, because these two techniques work in very different time frames, the question arises as to whether they can be used together simultaneously. By simulating a helicopter downwash profile, a two-dimensional vorticity model is used to determine seeding material concentrations produced as the result of dispensing material into the downwash. Continuous seeding while hovering, pulse seeding while hovering, and the effect of helicopter movement are examined. (Modified author abstract) GRA

N74-33112# Illinois Univ., Urbana. Lab. for Atmospheric Research.
A NUMERICAL STUDY OF CLOUD GROUPS Final Report, 15 Mar. - 30 Sep. 1973
Y. Ogura 30 Sep. 1973 15 p refs
(Contract DAHC04-71-C-0016; ARPA Order 1748)
(AD-781525; AROD-9943-8-A) Avail: NTIS CSCL 04/2

The main objectives of the research were to develop realistic model for an individual thunderstorm cell, and to investigate the relationships between the large-scale meteorological fields and cumulus cloud ensembles so that the parameterization for cumulus clouds in a global circulation model may be improved on a more scientifically sound basis. GRA

N74-32640 Columbia Univ., New York.
TRANSITIVITY EXPERIMENTS IN SEMI-EMPIRICAL TIME-DEPENDENT CLIMATE MODELS
Jane Hsiung *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 95-107 refs (For availability see N74-32635 22-08)

N74-32641 Illinois Univ., Urbana.
BOUNDARY CONDITIONS FOR A BAROTROPIC FORECAST MODEL
Mary Alice Rennick *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 109-129 refs (For availability see N74-32635 22-08)

N74-32642 Pennsylvania State Univ., University Park.
FRONTOGENESIS IN A TWENTY LEVEL ISENTROPIC PRIMITIVE EQUATION MODEL
Hampton N. Shirer *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 131-152 refs (For availability see N74-32635 22-08)

N74-32644 Washington Univ., Seattle.
MEASURED TROPICAL ATMOSPHERIC BOUNDARY LAYER CHARACTERISTICS COMPOSITED WITH RESPECT TO CLOUDS
Roland B. Stull *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 169-224 refs (For availability see N74-32635 22-08)

N74-32645 Texas Univ., Austin.
NUMERICAL STUDY OF ROSSBY-WAVE CRITICAL LEVEL DEVELOPMENT IN A BAROTROPIC FLOW
George H. Ward *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 225-250 refs (For availability see N74-32635 22-08)

N74-33352 Ludwig-Maximilians-Universitat, Munich (West Germany). Inst. fuer Meteorologie.
RESEARCH AND DATA REQUIREMENTS FOR CLIMATE STUDIES
Hans-Juergen Bolle *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 34 p refs (For availability see N74-33347 22-31)

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N74-33113# National Aviation Facilities Experimental Center, Atlantic City, N.J.
METHODOLOGY AND COMPUTER ANALYSIS FOR DETERMINING VOR/DME AND DME/DME AREA NAVIGATION ERRORS Final Report, Oct. 1970 - Sep. 1973
Harry Sorensen Feb. 1974 70 p refs
(AD-776714; FAA-RD-73-208; FAA-NA-73-91) Avail: NTIS HC $6.50

A computer analysis of VOR/DME and DME/DME area navigation is reported. The analysis includes three-dimension error models and an automated method of selecting the optimum stations to support an area navigation route structure. It is concluded that the computer program presented is useful for determining optimum stations to support an area navigation route. Additionally, certain subroutines can be used without the full analysis program to perform line-of-sight and geodetic calculations. Author

N74-33114*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A FLIGHT INVESTIGATION OF A TERMINAL AREA NAVIGATION AND GUIDANCE CONCEPT FOR STOL AIRCRAFT
D. W. Smith, F. Neuman, D. M. Watson, and G. H. Hardy Jul. 1974 17 p refs
(NASA-TM-X-62375) Avail: NTIS HC $3.00

A digital avionics system referred to as STOLAND has been test-flown in the NASA CV-340 to obtain performance data for time-controlled guidance in the manual flight director mode. The addvanced system components installed in the cockpit included an electronic attitude director indicator and an electronic multifunction display. Navigation guidance and control computations were all performed in the digital computer. Approach paths were flown which included a narrow 180-deg turn and a 1-min, 5-deg straight-in approach to the 30-m altitude go-around point. Results are presented for 20 approaches: (1) blended radio/inertial navigation using TACAN and a microwave scanning beam landing guidance system (MODILS) permitted a smooth transition from area navigation (TACAN) to precision terminal navigation (MODILS), (2) guidance system (flight director) performance measured at an altitude of 30.5 m was within that prescribed for category II CTOL operations on a standard runway, and (3) time of arrival at a point about 2 mi from touchdown was about 4 sec plus or minus sec later than the computed nominal arrival time. Author

N74-33115# National Aviation Facilities Experimental Center, Atlantic City, N.J.
TEST AND EVALUATION OF THE LEVEL 1 BEACON AUTOMATED RADAR TERMINAL SYSTEM (ARTS 3) Interim Report, Feb. - Jul. 1973
Martin Holtz Jan. 1974 125 p
(AD-773711; FAA-NA-73-83; FAA-RD-73-182) Avail: NTIS HC $9.25

The performance characteristics of the Level 1 Beacon Automated Radar Terminal System (ARTS III) were determined. A test bed was established to record ARTS III beacon target replies and reports on digital tape. Computer programs were prepared to process the digital tapes and to provide statistical data defining system performance. Technical tests were conducted to determine the characteristics of the ARTS III quantizer, bracket and code pulse recognition logic, and garble detection logic. In addition, the performance of the software code validation and target detection algorithms was established. Operational tests were conducted to determine the effect that a storage tube defruiter had on system performance. The test and evaluation program established the baseline standards of performance for the ARTS III system. This information will be used in development of a prototype level 2 beacon-processing subsystem. It was concluded that the pseudoleading edge detector does not operate in accordance with design specifications. Author

N74-33116# Boeing Commercial Airplane Co., Seattle, Wash.
DEVELOPMENT OF AN INDEPENDENT ALTITUDE MONITOR CONCEPT Final Report, Feb. 1973 - Sep. 1973
Donald L. Parks, Maxie M. Hayashi, and James R. Fries Sep. 1973 160 p refs
(Contract DOT-FA73WA-3233)
(AD-775454; D6-41293; FAA-RD-73-168) Avail: NTIS HC $5.00

Methods by which safe altitude is monitored and conveyed to the crew, and possible systems to provide an independent altitude monitor (IAM) function were investigated. Study effort was in three phases: (1) initial analysis and survey involved terminal area operations analysis, to define the overall circumstances under which IAM requirement exist: (2) accident data analysis, for accident types and circumstances to which an IAM might apply: and (3) operations/research/manufacturer/vendor survey, to identify associated problem areas and to determine the nature of ongoing research and systems development. Data collation/requirements analysis, included integration of information in a detailed analysis of approach/land functions, including specific actions and associated information requirements. Results provided the basis for identifying IAM system functional requirements. Concepts covered a variety of possibilities related to (1) basic IAM trade study requirements, (2) visual aids, (3) present and future landing systems, (4) airborne IAM systems, (5) cooperative/ground IAM systems, and (6) procedures and training considerations. Author

N74-33117# Lincoln Lab., Mass. Inst. of Tech., Lexington.
EFFECTS OF AIRBORNE TRANSPONDER ANTENNA LOBE SWITCHING ON EN ROUTE (PCD) AND TERMINAL (BDAS) BEACON REPLY PROCESSING Final Report
Ernest H. Day and James H. Pannell 29 Jan. 1974 186 p refs
(Contracts DOT-FA72WAI-242; F19628-73-C-0002)
(AD-776699; ATC-18; FAA-RD-73-109) Avail: NTIS HC $12.25

The comparative performances of switching top and bottom transponder antennas versus the bottom antenna alone, in target detection by ARTS and PCD, were investigated in order to determine which of the two antenna configurations is perferable. A variety of military aircraft participated, performing climbouts, orbits, straight and level segments, and descents, in order to expose a wide range of aspect angles to the interrogator. Data were collected at Washington, D. C., utilizing the ATCBI at Andrews Air Force Base, and at NAFEC, utilizing the Elwood site. The frequency of occurrence of lost targets, particularly of consecutive lost targets, was found to vary considerably from one aircraft type to another. Analysis of the reduced data provides a reasonable basis, however, for concluding that, to maximize average probability of detection, the bottom antenna is better in the terminal area but switching antennas are better for en route application. To minimize long sequences of misses which cause track loss on turns, the switching antenna appears more favorable in both flight regimes. The data also suggest that a higher probability of detection can be obtained in both environments, without incurring serious penalties, by reducing the leading edge detection thresholds. Author

N74-33118# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ATC SURVEILLANCE/COMMUNICATION ANALYSIS AND PLANNING Quarterly Technical Summary, 1 Dec. 1973 - 28 Feb. 1974
1 Mar. 1974 26 p refs
(Contracts DOT-FA72WAI-242; F19628-73-C-0002; FAA Proj. 022-243-012; FAA Proj. 033-241-062)
(AD-779556; FAA-RD-74-60) Avail: NTIS HC $3.25

Activities of the Air Traffic Control/Surveillance/Communication Analysis and Planning project are reported. The development of a full-coverage moving target indicator is discussed. A version of the feedback Clutter Mapper is described. Performance tests of the Airborne Beacon Interference Locator (ABIL), the Transponder Analyzer (TPA), and the E-scan (Electrically scanned antenna) were conducted. Author

N74-33119# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ATC SURVEILLANCE/COMMUNICATION ANALYSIS AND PLANNING Quarterly Technical Summary, 1 Sep. - 30 Nov. 1973
1 Dec. 1973 26 p refs
(Contracts DOT-FA72WAI-242; F19628-73-C-0002)
(AD-775313; FAA-RD-73-207) Avail: NTIS HC $4.50

Activities of the Air Traffic Control Surveillance/Communication Analysis and Planning project are reported. Excellent results have been obtained in detecting aircraft imbedded in heavy clutter using coherent S-band radar coupled to a specially programmed, wide dynamic range, digital signal processor. Performance tests of the Airborne Beacon Interference Locator (ABIL), Transponder Performance Analyzer (TPA) and the E-scan (Electrically scanned antenna) were also conducted. Author

N74-33120# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SURVEILLANCE AND COMMUNICATION ISSUES IN THE TRANSITION TO A DISCRETE ADDRESS BEACON SYSTEM, TASK A Final Report
W. I. Wells, ed. and R. Kramer, ed. 26 Dec. 1973 114 p refs
(Contract DOT-FA72WAI-242; F19628-73-C-0002)
(AD-774655; ATC-21; FAA-RD-73-125) Avail: NTIS HC $8.75

The transition from the Air Traffic Control Radar Beacon System (ATCRBS) based surveillance function with voice radio only to a Discrete Address Beacon System based surveillance function is discussed. An evaluation of the present ATCRBS system indicates basic adequacy in the present environment for the current mode of operation of the Air Traffic Control (ATC) System. The introduction of automation into the ATC system requires capability in the areas of data link and enhanced surveillance reliability for automatic tracking that the DABS system will provide. The techniques involved in the conversion to the DABS are discussed. Modifications to the ATCRBS to provide an improved interim capability are reported. Author

N74-33121# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PROVISIONAL MESSAGE FORMATS AND PROTOCOLS FOR THE DABS 32-CHARACTER ALPHANUMERIC DISPLAY
J. D. Welch and G. V. Colby 20 May 1974 16 p refs
(Contracts DOT- FA72WAI-261; F19628-73-C-0002)
(AD-780159; ATC-36; FAA-RD-74-84) Avail: NTIS HC $4.00

Formats and protocols are described for tactical Air Traffic Control displays to be driven by the Standard Message interface of a Discreet Address Beacon (DABS) system transponder and capable of handling a succession of data transmissions, each of which is individually acknowledged by a transponder reply before the transmission of the succeeding segment. Specific codes are defined for a display device up to 32 alphanumeric characters. Author

N74-33122# National Aviation Facilities Experimental Center, Atlantic City, N.J.
NAS ENROUTE STAGE A SYSTEM ENGINEERING AND ANALYSIS INVESTIGATION OF SYSTEM PROBLEMS RADAR DATA LOSS Final Report, Oct. 1972 - Mar. 1973
Harry T. Morgan, JR. Jan. 1974 21 p refs
(AD-773444; FAA-NA-73-60; FAA-RD-73-183) Avail: NTIS HC $4.25

A series of special engineering tests, designed specifically to evaluate NAS Model 3dl capability to reliably process and display radar data without loss, was conducted at the National Aviation Facilities Experimental Center (NAFEC) employing the Digital Simulation Facility and the System Support Facility. This report describes these tests and the results obtained. Author

N74-33123# Institute for Telecommunication Sciences, Boulder, Colo.
INVESTIGATION OF EFFECT OF ANTENNA SITE AND ANTENNA TYPE ON LF NON-DIRECTIONAL BEACON PERFORMANCE Final Report
L. A. Berry, R. G. FitzGerrell, and L. E. Vogler Dec. 1973 86 p refs
(Contract DOT-FA73WAI-342)
(AD-775316; FAA-RD-73-174) Avail: NTIS HC $7.50

The reasons that out-of-tolerance needle swings are indicated by low-frequency direction-finding receivers tuned to FAA non-directional beacon transmitters are investigated theoretically and experimentally. The main conclusions are: (1) the antenna type affects only the ease to tuning and the amount of effective radiated power, but not the directional characteristics. The cage monopole antenna appears to be the best of those studied, (2) the main cause of needle swings is large terrain features. All the terrain between the transmitter and receiver affects the needle swing, so only marginal improvement can be achieved by careful site selection or site modification, and (3) if all other things are equal, the size and frequency of needle swings caused by terrain decrease with decreasing radio frequency. Author

N74-33124# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DABS/ATCRBS TRANSPONDER BENCH TESTING PROGRAM Final Report
J. R. Samson, J. D. Welch, E. R. Becotte, E. A. Crocker, and H. D. Schofield 28 Nov. 1973 104 p
(Contracts DOT-FA72WAI-261; F19628-73-C-0002)
(AD-773768; ATC-25; FAA-RD-73-160) Avail: NTIS HC $8.25

Laboratory measurements were made of the Air Traffic Control Radar Beacon system (ATCRBS) transponder characteristics to determine the response of the existing population of transponders to candidate Discrete Address Beacon System (DABS) uplink transmissions. The purpose and scope of the tests are reviewed. The potential effects of the DABS uplink transmissions on the ATCRBS system are analyzed. General conclusions regarding alternative methods available for minimizing DABS interference to the ATCRBS system are presented. Author

N74-33125# Federal Aviation Administration, Atlantic City, N.J.
TEST REPORT: RADIOFREQUENCY INTERFERENCE/ ELECTROMAGNETIC INTERFERENCE MEASUREMENTS LOS ANGELES AIR ROUTE TRAFFIC CONTROL CENTER Final Report, Aug. 1972 - Jun. 1973
Margaretta V. Stone Mar. 1974 272 p refs
(Contract DOT-FA72NA-728)
(AD-776961; FAA-RD-74-11; FAA-NA-73-92) Avail: NTIS HC $6.50

Electromagnetic interference tests were conducted at the Los Angeles Air Route Traffic Control Center at Palmdale, California. The measurements included radiated and conducted emission from the automated system and nonautomated equipments, and radiated and conducted susceptibility of the automated system. Most of the automated systems met the prescribed susceptibility limits. The exceptions were the plain view display, the nonradar keyboard multiplexer, the common logic unit, the input/output control element, the data receiver group, and the coded time sequence receiver. It was concluded that the automated system is unlikely to be affected by electromagnetic intereference generated within a typical air route traffic control center. Author

N74-33126# Federal Aviation Administration, Atlantic City, N.J.
TEST AND EVALUATION OF A CONFLICT ALERT CAPABILITY FOR THE NAS ENROUTE SYSTEM Interim Report, May - Sep. 1973
Joseph Levy and Frederick Ranger Feb. 1974 21 p
(FAA Proj. 122-111-010)
(AD-776145; FAA-RD-74-15) Avail: NTIS HC $3.00

A series of tests of a conflict alert capability was conducted over a period of 4 months to evaluate the operational suitability of a system which alerts radar controllers to potential violation of radar separation standards. These tests were conducted in a beacon only high-altitude airspace environment with simulated digital target data. This report describes these tests and the results obtained. Author

N74-33127# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Aerospace and Electronic Systems Div.
ANALYSIS, MODIFICATION, AND TEST OF INSTRUMENT LANDING SYSTEM GLIDE SLOPE WAVE-GUIDE ANTENNA Final Report, Jul. 1971 - Sep. 1973
Robert A. Moore, George J. Moussally, Thomas W. Parker, and Stephen F. Payer Jan. 1974 78 p refs
(Contract DOT-FA71WA-2666; FAA Proj. 45317)
(AD-779558; FAA-RD-73-186) Avail: NTIS HC $4.00

Investigative techniques have been developed and used to develop and evalute glide slope techniques for problem site conditions. These techniques were used to serve as a basis for developing and evaluating modification of the 60 foot waveguide array and the reduced aperture array and for evaluation of the Redlich array. Evaluation of the antenna was carried out in terms of a digital modeling of this performance as measured by computed characteristics equivalent to those normally taken for commissioning, i.e., level flight and structures. Synthesis was used to develop patterns for a reduced aperture array. Criteria were a minimum width lower SBO lobe with suppressed radiation below the lower SBO lobe to at least 15 deg. Compensating elements for sidelobe cancellation were designed, tested, and installed at each end of the 60 foot waveline antenna. A series of radiation pattern tests under various antenna operating conditions were

performed. A flight test program was carried out in and environment relevant to both flat and broken ground and rising terrain in the approach area under conditions of compensation and non-compensation. The design, installation, and test of an aperture monitor system are also described. Author

N74-33128# ASE, Inc., Pennsauken, N.J.
DEVELOPMENT AND TEST OF LOW IMPACT RESISTANCE STRUCTURES. VOLUME 2: INTERFERENCE OF LOW IMPACT RESISTANCE STRUCTURES WITH ILS SIGNALS Final Report
Roy C. Spencer Feb. 1974 93 p refs
(Contract DOT-FA72WA-3043)
(AD-781859; FAA-RD-73-187-2-Vol-2) Avail: NTIS HC $4.00

The effects of radiation scattering by the light supports of the Approach Landing System light supports in front of the Course Antenna were investigated. It was determined that no course errors will be produced by the radiation scattering. The rationale for this conclusion is presented. Various investigations which support the conclusion are discussed. Author

N74-33129# National Aviation Facilities Experimental Center, Atlantic City, N.J.
AN EVALUATION OF A MICROWAVE RUNWAY PERSPECTIVE INDEPENDENT LANDING MONITOR SYSTEM Final Report, Jun. 1967 - Aug. 1972
Robert H. Pursel Feb. 1974 43 p refs
(FAA Proj. 073-322-000)
(AD-774658; FAA-NA-73-95; FAA-RD-73-201) Avail: NTIS HC $3.25

The landing monitor system was evaluated in flight test in a DC-7 aircraft at the National Aviation Facilities Experimental Center, Atlantic City, New Jersey. The system utilized eight microwave transmitters spaced in a pattern along runway 13. Passive airborne equipment received pulses from these transmitters and displayed the video on a head-up viewer. The system was found to be highly susceptible to multipath reflections which caused a rapid display jitter. This problem was greatly reduced by the addition to the airborne equipment of a signal smoother. It was also found that the accuracy of usage of the basic display was unacceptable and that aiding symbology would have to be added to the display to improve accuracy of usage. Author

N74-33130# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DEVELOPMENT OF A DISCRETE ADDRESS BEACON SYSTEM Quarterly Technical Summary, 1 Oct. - 31 Dec. 1973
1 Jan. 1974 81 p refs
(Contracts DOT-FA72Wai-261; F19628-73-C-0002; FAA Proj. 034-241-012)
(AD-776118; FAA-RD-74-8; QTS-8) Avail: NTIS HC $7.25

Studies of the performance specifications incorporated in the Discrete Address Beacon System (DABS) engineering development model requirements documents were conducted. The studies included the following: (1) the prediction of link performance under marginal operating conditions, (2) the assessment of coding performance and candidate preambles, and (3) the extension of sensor coverage predictions. Also included are the objectives of an effort to explore highly interrelated system and sensor functions by computer simulation. Descriptions of the latest modes of operation of the Channel Management, Surveillance processing, Data Link processing, and Network Management Functions and their subfunctions. Author

N74-33131# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE EFFECTS OF ATCRBS P2 PULSES ON DABS RELIABILITY
W. H. Harman and D. A. Shnidman 28 Jan. 1974 66 p refs
(Contracts DOT-FA72WAI-261; F19628-73-C-0002; FAA Proj. 034-241-012)
(AD-776141; ATC-20; FAA-RD-74-4) Avail: NTIS HC $6.50

The effects of Air Traffic Control Radar Beacon System Discrete Address Beacon System (ATCBS) P sub 2 pulses as interference to (DABS) uplink transmissions were studied. These effects constitute a major component of all uplink error-producting mechanisms that are anticipated to occur in DABS operation. Effects are included of both receiver noise and P sub 2 pulse interference, where the interference can be received from any of a number of different transmitters at different distances from the receiving aircraft. The results are given as the probability of a miss, where a miss is the event that at least one of the bits in the DABS data block is demodulated in error. The study is carried out for both DPSK and PAM which are the two modulation options being considered in the DABS design. Results are given both as general formulas and as evaluations of these formulas in various specific cases. In these evaluations, the interference environment is based on ATCRBS interrogator locations, transmitter powers, and repetition frequencies as listed in ECAC's IFF Master File. The numerical results are presented graphically to display the dependence on signal level, noise level, and geographical location between Boston and Washington, D. C. A concept referred to as effective interference tolerance is introduced, and numerical evaluations are presented to indicate the accuracy of this concept. Author

N74-33132# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A SUMMARY OF THE DABS TRANSPONDER DESIGN/COST STUDIES
T. J. Goblick and P. H. Robeck 1 Mar. 1974 46 p
(Contracts DOT-FA72WAI-261; F19628-73-C-0002; FAA Proj. 034-241-012)
(AD-776140; FAA-RD-74-17) Avail: NTIS HC $5.25

Design/cost studies of the Discrete Address Beacon System transponder were conducted. The transponders are to be used with the Air Traffic Control System for general, military, and commercial applications. The impact of the alternative techniques and the design choices being considered on the transponder cost are analyzed. The effect of the transponder design/cost studies on the design of the signal and message formats is reported. Author

N74-33133# Lincoln Lab., Mass. Inst. of Tech., Lexington.
REPORT ON DABS/ATCRBS FIELD TESTING PROGRAM
J. R. Samson and E. A. Crocker 13 Feb. 1974 56 p ref
(Contracts DOT-FA72WAI-261; F19628-73-C-0002)
(AD-775290; FAA-RD-74-5; ATC-31) Avail: NTIS HC $6.00

The effect of the Discrete Address Beacon System (DABS) uplink formats on the Air Traffic Control Radar Beacon System (ATCRBS) transponders was evaluated. The DABS interrogations tested were: (1) a combined ATCRBS Mode A/DABS All-Call consisting of a standard uplink message transmission consisting of a P sub one - P sub two pulse pair followed by 25 microseconds of 4 megabit per second pulse shift keying modulation. The recommended DABS uplink transmissions result in an effective combined ATCRBS/DABS All-Call mode and minimum triggering of ATCRBS transponders by DABS message transmissions. Author

N74-33134# Eurocontrol Agency, Maastricht (Netherlands).
MAASTRICHT UAC: FIRST EUROPEAN AIR TRAFFIC CONTROL CENTER [MAASTRICHT U.A.C. - ERSTE EUROPAEISCHE LUFTVERKEHRS-KONTROLLZENTRALE]
Hans Juergen VonVilliez 1 Oct. 1973 99 p Partly in GERMAN, and partly in ENGLISH
(MAS-D/306.2.2; MAS-D/306.3) Avail: NTIS HC $4.00

The operations of the first European upper area Air Traffic Control Center at Maastricht (Netherlands) are described, and related data are supplied. The control center is part of Eurocontrol, an organization in which 10 European countries cooperated. The center processes data in the field of aeronautics, navigation, and meteorology, but the main information sources are flight plans and radar data, which are described in more detail. ESRO

N74-33135# Meta Systems, Inc., Santa Clara, Calif.
PROGRESS REPORT VERIFICATION IN AN AUTOMATED OCEANIC AIR TRAFFIC CONTROL SYSTEM Final Report, Mar. 1972 - May 1973
Frank V. Giallanza, Charles P. Giallanza, and James C. Brown May 1973 47 p
(Contract DOT-FA72WA-2851)
(AD-780803; FAA-RD-73-70) Avail: NTIS CSCL 17/7

An algorithm was developed to verify the content of progress reports input to an automated oceanic air traffic control system. The reporting position, reporting time, flight level, next reporting fix and the pilot's estimated time of arrival at the next reporting

fix is checked for consistency with the pilot's filed flight plan.
Author (GRA)

N74-33136# TRW Systems Group, Redondo Beach, Calif.
ARMY NAVSAT USER EQUIPMENT DESIGN STUDY, VOLUME 1 Final Report
Richard E. Sansom Feb. 1974 436 p refs
(Contract DAAB07-73-C-0275)
(AD-781000; TRW-24443-6009-TU-00-Vol-1; ECOM-0275-F-73-Vol-1) Avail: NTIS CSCL 17/7

This study presents a design concept for the Army User Equipment (AUE) Navigation Satellite Positioning System. The equipment which has been studied consists of a sequential or timeshared receiver, a digital computer, the necessary input/output consoles, the power supply, and antenna system. The study concentrates on analyzing the anticipated effects of such real world phenomena as satellite masking, foliage, attenuation, jamming, and user dynamics. The study presents a viable sequential receiver design along with requirements for the computer, power supply and antenna for both the ground (manpack and vehicle) and the helicopter user categories. The study shows that, in general, the receiver design postulated is adequate for the missions and user requirements considered.
Author (GRA)

N74-33137# Coast Guard Research and Development Center, Groton, Conn.
DESIGN, CONSTRUCTION AND EVALUATION OF A LASER RANGE LIGHT Final Report
A. V. Arecchi and D. J. Pietraszewski Apr. 1974 13 p
(AD-781716; CGR/DC-9/74; USCG-D-93-74) Avail: NTIS CSCL 17/7

A full-size breadboard model of a laser range light was built and installed in the St. Mary's River south of Sault Ste. Marie, Michigan. The system was evaluated for its potential as an operational aid to marine navigation. The beam from the laser was aimed horizontally over the water. The light scattered by particles in the air formed a beam, or range line, in the sky which could be followed by a mariner. The operating characteristics of this system are presented and design problems are discussed.
Author (GRA)

N74-33138# Ohio Univ., Athens. Dept. of Electrical Engineering.
ALL-WEATHER, LOW-LEVEL NAVIGATION AND IMPLEMENTATION OF A ONE-WAY RANGING, RANGE-RANGE NAVIGATION SYSTEM Final Report, Oct. 1973 - Mar. 1974
Mar. 1974 111 p refs
(Contract DAAB07-71-C-0156)
(AD-780708; EER-16-21; ECOM-0156-F-71) Avail: NTIS CSCL 17/7

The report contains a synopsis of a six and one-half year effort in research and development activities in low-level, all-weather aircraft navigation. Background work is described leading to the successful flight test of the low frequency direct ranging range-range navigation system developed. Theory of the TRF MLE receiver processors used in the tests is discussed and future developments suggested. A learning version of the processor using a priori information is discussed and methods for making the processor adaptive are outlined. Airborne phase measuring techniques have been investigated. Both analog and digital as well as mixed methods are considered. A digital local oscillator for a projected superheterodyne model is studied. Work on auto-correlation and statistical data collection is reported. (Modified author abstract)
GRA

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N74-33139# Brookhaven National Lab., Upton, N.Y. Dept. of Applied Science.
CONTROLLED THERMONUCLEAR RESEARCH. SURVEY OF APPLICATIONS OF FUSION POWER AND TECHNOLOGY TO THE CHEMICAL AND MATERIALS PROCESSING INDUSTRIES Bimonthly Report, Jan. - Feb. 1974
M. Steinberg, J. Powell, and M. Beller 1974 6 p
(BNL-18745; BMR-4) Avail: NTIS HC $4.00

Current efforts are directed toward processes and markets which can utilize the energy forms from fusion reactors. A list is given that outlines various products and processes which are energy-intensive. The thermal reactions may utilize energy directly or indirectly. Directly indicates that the process gas is introduced into the blanket to obtain the required energy. Indirectly indicates that the process gas is heated by heat exchange with blanket coolant gas. The heat exchange may be accomplished by regenerative pebble-bed heaters, in which alternate beds are heated by reactor coolant gas (e.g., helium). By appropriate valving, the hot bed then gives up its stored heat to the process gas while the other bed is heated.
NSA

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology; and 29 Space Radiation.

N74-33140 British Broadcasting Corp., Kingswood (England). Research Dept.
QUADRAPHONY: TECHNIQUES INVOLVED IN FOUR CHANNEL RECORDING AND REPRODUCTION
D. J. Meares Jul. 1974 12 p refs
(BBC-RD-1974/26) Avail: BBC, Kingswood Warren, Tadworth, Surrey, Engl.

A series of tests has been carried out, and recordings made, to identify some of the problems that will be encountered in recording and reproducing quadraphonic programme material. Various microphone and loudspeaker arrangements have been evaluated with the main aim of re-creating, in the listening room, the acoustic qualities of the original environment. In the case of orchestral music this aim is the re-creation of all the acoustic qualities of the best seat in a concert hall. Recommendations are made with regard to future work on special microphones for quadraphonic use.
Author

N74-33141 Paris Univ., Orsay (France). Lab. d'Optique Quantique.
THEORETICAL AND EXPERIMENTAL STUDY OF OPTICAL NONLINEARITIES Final Report [ETUDE THEORIQUE ET EXPERIMENTALE DES NON LINEARITES OPTIQUES COMPTE RENDU DE FIN DE CONTRAT]
Sep. 1973 9 p refs In FRENCH
(Contract DGRST-66-00-71)
Avail: Issuing Activity

Mechanisms responsible for nonlinear terms of macroscopic polarization induced in a perfect dielectric crystal by an optical wave are discussed. The second order susceptivity for type 3 and 4 semiconductors was calculated in the transparency zone (between the electronic transition threshold and the absorption bands linked with the lattice). In the same domain the third order susceptivity was also calculated.
ESRO

N74-33142*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE MIRRORS Patent Application
David E. Pitts, inventor (to NASA) Filed 27 Feb. 1974 11 p
(NASA-Case-MSC-12611-1, US-Patent-Appl-SN-446560) Avail: NTIS HC $4.00 CSCL 20F

Methods and apparatus for coating a curved surface in a zero gravity environment to form a mirror are reported.
NASA

N74-33143*# Linguistic Systems, Inc., Cambridge, Mass.
CURVES OF EQUAL LOUDNESS WITH OCTAVE-FILTERED SOUND IN A DIFFUSE SOUND FIELD

L. Cremer, G. Plenge, and D. Schwerzl Washington NASA Aug. 1974 33 p refs Transl. into ENGLISH from Acustica (West Germany), V. 9, 1959 p 65-75
(Contract NASw-2482)
(NASA-TT-F-15740) Avail: NTIS HC $4.75 CSCL 20A

After an introduction on the definition of loudness and its measurement, an apparatus for measuring curves of equal loudness with noise passed through octave filters and the mode of operation of the equipment is described. Especially the behavior of the persons taking part is discussed. The possibility of introducing a noise level meter with data taken in a diffuse sound field, which show a fall of about 3 db per octave, is also discussed. Author

N74-33144*# Kanner (Leo) Associates, Redwood City, Calif.
PLANAR NONLINEAR OSCILLATIONS OF THE CENTER OF MASS OF A SOLID WITH A MAGNETIC DAMPER
K. K. Lavrinovich Washington NASA Aug. 1974 20 p refs Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 70-82
(Contract NASw-2481)
(NASA-TT-F-15811) Avail: NTIS HC $4.00 CSCL 20K

Nonlinear planar oscillations of a solid body with respect to the center of mass were studied under the following assumptions: (1) the center of mass of this body moves in a circular trajectory by gravity around another body having a central Newtonian gravitational field; (2) the attracting body has a magnetic field; (3) the moving body contains a damper (magnetic)--damping momentum is proportional to the first power of angular velocity of motion of the magnetized globe with respect to the damper and (4) the moving body is affected by external excitation momentum represented as a Fourier series in terms of powers of orbit frequency. Author

N74-33145*# Kanner (Leo) Associates, Redwood City, Calif.
DETERMINATION OF ANGULAR POSITION AND ANGULAR VELOCITIES AT THE END OF THE PHASE OF ACTIVE VARIATION IN ANGULAR VELOCITY
V. S. Novoselov Washington NASA Aug. 1974 10 p ref Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 177-181
(Contract NASw-2481)
(NASA-TT-F-15821) Avail: NTIS HC $4.00 CSCL 20K

The angular position and angular velocities at the end of the phase of active variation in angular velocity are defined with the aid of Euler angles (for the structural system of coordinates with respect to the immobile system), kinetic momentum, and differential equations. Author

N74-33146*# Kanner (Leo) Associates, Redwood City, Calif.
DEVELOPMENT OF ACOUSTICAL METHODS
J. Bongrand and P. Lienard Washington NASA Sep. 1974 22 p Transl. into ENGLISH of "Le Developpement des Moyens Acoustiques", Rept. 66/S/ZDL/74 Centre d'Essais Propulseurs, Saclay, France, 30 May 1974 13 p Presented at Colloque ISL, Saclay, France, 14-16 May 1974
(Contract NASw-2481)
(NASA-TT-F-15940; Rept-66/S/ZDL/74) Avail: NTIS HC $4.25 CSCL 20A

Already-existing installations including the anechoic chamber, the ONERA combustion laboratory, wave propagation tubes for study of the noise generated by rotary machines and other small-scale purposes, the SNECMA soundproofed compressor test bench, and the large Modane SI wind tunnel are described. Installations being planned or currently under construction including the ONERA anechoic chamber with wind tunnel, for research on pipes' rotor fans, blown wings, etc., a free-flow wind tunnel, and the acoustical metrology laboratories are discussed. Author

N74-33147*# Kanner (Leo) Associates, Redwood City, Calif.
PROBLEM OF FAST ACTION IN A PLANE
A. S. Shmyrov and V. S. Novoselov, ed. Washington NASA Aug. 1974 12 p Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 57-63
(Contract NASw-2481)
(NASA-TT-F-15809) Avail: NTIS HC $4.00 CSCL 20K

The problem of the optimal speed of response is stated in terms of the velocity of the mapping set, and control functions. It is shown that if a trajectory is realized by both systems of equations, an optimal increase in an argument in one system is also optimal for the other. Author

N74-33148# Royal Aircraft Establishment, Farnborough (England).
ACOUSTIC FEEDBACK OF A SUBSONIC AND SUPERSONIC FREE JET WHICH IMPINGES ON AN OBSTACLE
G. Neuwerth Apr. 1974 30 p refs Transl. into ENGLISH from Deutsche Luft- und Raumfahrt rept DLR-FB-72-72
(RAE-Lib-Trans-1739; BR41670; DLR-FB-72-72) Avail: NTIS HC $4.50

When a circular subsonic free jet impinges on an obstacle, for example 'blown flaps' or for VTOL the ground, one can observe exit Mach numbers, and for distances from the obstacle h< 6 to 7 times the nozzle diameter d sub j, a stationary wave pattern in the jet core, periodical ring vortices in the jet boundary and discrete frequencies of high intensity in the noise and turbulence spectrum. The sound pressure level is enlarged by about 10 db. These phenomena can be explained by the feedback between the flow and the pressure field generated by it. The Strouhal numbers are determined as a function of d sub j, h/d sub j, Ma and T sub a. A pressure wave in the jet core which is responsible for feedback has been investigated. In the noise spectrum of an underexpanded jet there are discrete screech frequencies generated by feedback. But when a choked jet impinges on an obstacle it has been found that this becomes the dominant sound source when between it and the nozzle exit there are less than five cells of the jet. The feedback mechanism for this case was investigated and the discrete frequencies were determined as a function of h/d sub j, and the pressure ratio of the nozzle. The appearance of two different vortex modes is explained. Possibilities to destroy the feedback and to reduce the noise are also given. Author

N74-33149# Los Alamos Scientific Lab., N.Mex.
CRYOGENICS SAFETY IN A HYDROGEN FUEL SOCIETY
R. Reider, F. J. Edeskuty, and K. D. Williamson, Jr. [1974] 20 p refs Presented at 5th Intern. Cryogenic Eng. Conf., Kyoto, 7-10 May 1974
(Contract W-7405-eng-36)
(LA-UR-74-340; Conf-740509-1) Avail: NTIS HC $3.00

An inevitable world-wide shortage of fossil fuel and concern for environmental pollution have aroused interest in hydrogen as a synthetic clean fuel. To make liquid hydrogen a universally attractive fuel requires only an extension of existing technology. The fundamentals of cryogenic safety with specific attention to hydrogen are reviewed with respect to material properties, control of ignition sources, management of leaks, inerting and ventilating, analysis of spills, cold injury, air condensation and oxygen enrichment, pressure relief and thermal stresses. Problems of standards and regulations, safety training, development of operating procedures, and emergency plans must be addressed thoroughly before the common use of liquid hydrogen will receive public acceptance. The nature and consequences of hydrogen accidents are analyzed. Author (NSA)

N74-33150# Army Foreign Science and Technology Center, Charlottesville, Va.
ANALYSIS OF MEASUREMENT SIGNALS
22 May 1974 63 p Transl. into ENGLISH from the book "Akusticheskie Izmereniya" Moscow, 1971 p 118-167
(AD-781170; FSTC-HT-23-1779-73) Avail: NTIS CSCL 20/1

When performing spectral analysis, a number of important factors must be considered: response of the measuring circuits, frequency range of analysis, etc. The characteristics of standard analyzers are presented and discussed. Correlational analysis of acoustic processes is discussed and standard correlational analyzers are described. Statistical analysis is important in the field of random processes. Nonlinear distortions must be measured and taken into account. GRA

N74-33151# New Mexico State Univ., University Park. Dept. of Physics.
RESEARCH IN THE AREA OF ATMOSPHERIC MODELING:

HIGH RESOLUTION ATMOSPHERIC IR TRANSMITTANCE PREDICTION
August Miller, Robert L. Armstrong, and Charles W. Welch Jun. 1974 126 p refs
(Contract DAAD07-73-C-0134; DA Proj. 1T0-61102-B-53A) (AD-780914; NMSU-PHYS-537-74-1) Avail: NTIS CSCL 20/6

The basic elements of line by line prediction of atmospheric transmittance at infrared wavelengths, and the quantum mechanical bases of line parameter computation are reviewed. A FORTRAN 4(G) computer program using the AFCRL Atmospheric Absorption Line Parameters Data Compilation tape for high resolution transmittance prediction under homogenous conditions is presented together with running instructions. An analysis of the effects of the using collisionally narrowed line profiles rather than simple Lorentzian profiles is also included, and suggests that collisional-narrowing may be significant with certain types of transmission paths. Author (GRA)

N74-33152# Army Foreign Science and Technology Center, Charlottesville, Va.
SCATTERING AND ABSORPTION OF LIGHT IN THE ATMOSPHERE
G. Sh. Livshits, Z. V. Karyagina, D. A. Rozhkovskii, and T. B. Omarov 4 Dec. 1973 207 p refs Transl. into ENGLISH from Tr. Inst. Astrofizicheskii, Akad. Nauk Kaz. SSSR (Alma Ata), v. 18, 1971
(AD-781013; FSTC-HT-23-1283-73) Avail: NTIS CSCL 20/6

The book presents a detailed survey of light scattering studies of the daytime sky, the results of brightness and polarization measurements of the sky and observations of the horizontal transparency of the atmosphere. The problem of determining the albedo of localities from measurements of the air field of the descending radiation is studied and the apparatus for the measurement of the brightness and polarization of the sky in the ultraviolet region of the spectrum is described. A great deal of attention is given to the study of atmospheric aerosols, in particular, to an investigation of the pure light absorption in aerosols and the spectrum of the large fraction of the particles. GRA

N74-33153# Army Foreign Science and Technology Center, Charlottesville, Va.
FREQUENCY CONVERSION WITH DOUBLE MODULATION OF LIGHT IN LIGHT RANGEFINDERS
I. I. Adriabova, L. N. Asnis, A. I. Vereschaka, Z. V. Nesterova, and Yu. V. Popov 16 Oct. 1973 13 p refs Transl. into ENGLISH from Opt.-Mekh. Prom. (USSR), no. 5, 1972 p 8-11
(AD-781215; FSTC-HT-23-775-73) Avail: NTIS CSCL 20/6

Nonlinear distortions are studied with dual modulation by polarization resulting from the use of light modulation. Nonlinear distortions can be reduced by selecting operating modes of the light modulator and converter. Thus, an optical-radiation modulator and converter in a light range finder can be used with frequency conversion and dual light modulation, thereby reducing the frequency, and the problems connected with high frequency. GRA

N74-33154# Naval Training Equipment Center, Orlando, Fla.
OPTICAL RELATIONSHIPS FOR VISUAL SIMULATION SYSTEMS
George Derderian May 1974 10 p
(NAVTRAEQUIPCEN Proj. 3717-02)
(AD-781887; NAVTRAEQUIPC-IH-235) Avail: NTIS CSCL 20/6

The three basic optical characteristics of visual simulation systems are discussed; namely, field of view, exit pupil diameter, and viewing distance. They are illustrated by means of two examples: a direct refractive display, and a relay image display. Author (GRA)

N74-33155# Naval Research Lab., Washington, D.C.
PROP-1: AN EFFICIENT IMPLICIT ALGORITHM FOR CALCULATING NONLINEAR SCALAR WAVE PROPAGATION IN THE FRESNEL APPROXIMATION Final Report
Peter B. Ulrich 29 May 1974 68 p refs
(AD-781877; NRL-7706) Avail: NTIS CSCL 20/6

An algorithm has been developed to advance rapidly the solution of the parabolic equation which describes the problem of propagation of intense laser beams in absorbing media. The method uses an alternating-direction implicit (ADI) technique together with either central differencing or a Galerkin method with linear spline basis to represent the transverse Laplacian in the partial differential equation. A guide to the code, a listing of the FORTRAN program, and a flow-chart are provided. Author (GRA)

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N74-33156 Commissariat a l'Energie Atomique, Saclay (France). Section des Applications des Radioelements.
USE OF COMPTON EFFECT IN CHEMICAL ANALYSIS AND PHOTON SPECTROMETRY Final Report [ETUDE EXPLORATOIRE DES POSSIBILITES OFFERTES PAR L'EFFET COMPTON DANS LE DOMAINE DE L'ANALYSE CHIMIQUE ET DE LA SPECTROMETRIE DES PHOTONS]
P. Martinelli Nov. 1973 157 p In FRENCH
(Contract DGRST-72-7-0617)
Avail: Issuing Activity

The continuous energy variation of computer effect diffused photons was used to observe K and L absorption discontinuities in some atomic elements. Tests were performed with radioisotopes 125 I and 241 Am. Results show that dosimetry of Ag in aqueous solution in presence of Cd was possible with sensitivity better than 0.2 g/l. By absorptimetry the neighbor elements Er, Ho, Dy, Tb, and Gd present in the same solution can also be measured. The use of a known absorber allows the determination of the primary photons below 200 KeV with 0.1% precision. Theoretical studies dealt with the choice of adequate diffusers, comparison with crystalline diffraction, and influence of bond energies of the diffusing electrons over the range of angular field perturbed when scanning across discontinuities. The possibility of using radioisotopic sources or X-ray tubes was investigated. New spectroscopic methods are proposed. ESRO

N74-33157 Commissariat a l'Energie Atomique, Saclay (France). Service d'Analyse et d'Etudes en Chimie Nucleaire et Isotopique.
DEVELOPMENT OF A NEW TRACE ELEMENT ANALYSIS METHOD BY CHARACTERISTIC X-RAY SPECTRUM LINES UPON CHARGED PARTICLE BOMBARDMENT Final Report [ETUDE ET MISE AU POINT D'UNE NOUVELLE METHODE D'ANALYSE D'ULTRA TRACES PAR DETECTION DES RAIES X CARACTERISTIQUES DES ELEMENTS BOBMARDES PAR DES PARTICULES CHARGEES]
C. Engelmann and M. Poncet Dec. 1973 35 p refs In FRENCH
(Contract DGRST-72-7-0857)
Avail: Issuing Activity

A method for trace element analysis in the picogram range is presented. The experimental setup was a 2 MeV Van de Graaff or a fixed energy cyclotron for excitation by protons between 0.4 and 1.4 MeV, or by carbon ions at 13.5 MeV. The X-ray emission was measured for 12 elements between aluminum and lead. The variation of the emission factor was measured with protons as a function of energy. The detection sensitivity as a function of atomic number was established, and the potentialities for thick targets were compared for the two types of bombarding particle. In thin films the X-ray emission and continuous background effects were studied as a function of target thickness. It is shown that it is possible to determine quantitatively minute amounts of elements in the region of atomic number 30 with a detection limit of some 0.0001 microgram. ESRO

N74-33158*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ENERGY DISTRIBUTION CROSS SECTION IN THRESHOLD ELECTRON-ATOM IMPACT IONIZATION

A. Temkin Aug. 1974 13 p refs Submitted for publication (NASA-TM-X-70745; X-602-74-239) Avail: NTIS HC $4.00 CSCL 20H

The flatness of the energy differential cross section in impact ionization is derived analytically in the Wannier theory. However it is shown that the Wannier zone is confined to a region of the order E/5 is less than or equal to epsilon is less than or equal to 4E/5, where E is the available energy and epsilon is the energy of the electrons. By contrasting the known results of photoionization and photodetachment, one can cogently argue that in the complementary region where electrons share their energy very unequally the cross section rises to a value independent of E, and that this region determines the form of the threshold law. Author

N74-33159*# Kanner (Leo) Associates, Redwood City, Calif.
NUCLEAR PROSPECTORS OF EARTH AND SPACE OBJECTS
Ye. M. Filippov Washington NASA Sep. 1974 156 p refs Transl. into ENGLISH of the book "Yadernyye Razvedchiki Zemnykh i Kosmicheskikh Obyektov" Novosibirsk, Nauka Press, 1974 p 1-138
(Contract NASw-2481)
(NASA-TT-F-15140) Avail: NTIS HC $11.00 CSCL 20H

Nuclear geophysics is reviewed beginning with a treatment of the distribution of radioactive elements in the land, sea, and meteorites. Nuclear unmanned prospecting landers intented for use on Mars, Venus, the Moon, and Jupiter are described. Nuclear densimeters, moisture meters, specialized element detectors, well-logging devices, neutron and X-ray tubes are described as developed in the U.S.S.R. and abroad. Particle accelerators as applied in geophysics and geology are discussed. Author

N74-33160*# Virginia State Coll., Petersburg.
RESEARCH PROGRAM IN NUCLEAR AND SOLID STATE PHYSICS Annual Report, 1 Sep. 1973 - 3 Aug. 1974
30 Sep. 1974 47 p
(Grant NGR-47-014-006)
(NASA-CR-140054) Avail: NTIS HC $5.50 CSCL 20H

The survey of negative pion absorption reactions on light and medium nuclei was continued. Muon spin precession was studied using an iron target. An impulse approximation model of the pion absorption process implied that the ion will absorb almost exclusively on nucleon pairs, single nucleon absorption being suppressed by energy and momentum conservation requirements. For measurements on both paramagnetic and ferromagnetic iron, the external magnetic field was supplied by a large C-type electromagnet carrying a current of about 100 amperes. J.A.M.

N74-33161# Ecole Nationale Superieure de Techniques Avancees, Paris (France).
MAGNETIC NUCLEAR RESONANCE APPLIED TO THE STUDY OF AMORPHOUS MATERIALS [RESONANCE MAGNETIQUE NUCLEAIRE APPLIQUEE A L'ETUDE DES CORPS AMORPHES]
J. Szeftel 1974 28 p In FRENCH
(Rept-034) Avail: NTIS HC $4.50

The application of NMR to amorphous materials at very low temperatures is reported. Theoretical foundations of the method are detailed with regard to nuclear spin definition and properties, free spin behavior in the magnetic field, quadrupole moment, nuclear relaxation, and spin-lattice relaxation. The experimental technique is reviewed with regard to the pulsed Clarke spectrometer and the cryostat. Measurements are possible between 1.2 and 4.2 degrees Kelvin. Parameters investigated were specific heat, thermal conductivity, and spin-lattice relaxation. Results are discussed with regard to the degree of crystallinity and compared to results of other authors. Experiments were performed on selenium and a boron oxide, the latter in both forms amorphous and crystalline. ESRO

N74-33162# Westfield Coll., London (England). Dept. of Physics.
A PHASE CORRECTED REGGE POLE MODEL FOR NEGATIVE PION ON PROTON YIELDS NEUTRAL PION AND NEUTRON
David Joynson Apr. 1974 28 p refs Sponsored by UK Sci. Res. Council
Avail: NTIS HC $4.50

A phase corrected Regge pole is defined where the imaginery part of the Regge amplitude is given by the standard Regge pole model but the real part is calculated from fixed t dispersion relations. This model is applied to negative pion proton yields neutral pion neutron in the intermediate energy range. A good fit to the data was obtained. Author (ESRO)

N74-33163# Rome Univ. (Italy). Inst. of Physics.
SOME REMARKS ON A UV DETECTION SYSTEM FOR A H2 STREAMER-CHAMBER
G. Amato (CERN), F. Cesaroni, and M. Severi 4 Mar. 1974 7 p refs
(Nota-Interna-537) Avail: NTIS HC $4.00

A proposal for the use of gaseous hydrogen both as a target and detecting medium in a streamer chamber is presented. The proposal aims at facilitating the detection of low energy particles in the range from 0.001 to 0.15 GeV/c squared for the transferred momentum of protons. Knowing the ratio between UV and visible radiation to be on the order of 60, it was proposed that a UV-sensitive TV camera tube as the detector. The MgF2 windows and UV-sensitive cathode with 5% quantum efficiency in conjunction with proximity focus intensifiers of gain 50 are available. In the proposed tube these elements would be followed by a secondary emission convertor target with an intrinsic sensitivity ten times higher than photographic emulsion. The optics could be of the Cassegrain type with composite reflectivity 0.6 yielding a lens aperture of 1.5. Procedures for tube calibration are outlined. ESRO

N74-33164# Interuniversitair Reactor Instituut, Delft (Netherlands).
DIFFUSION OF TWO OPPOSITELY CHARGED IONS IN EACH OTHER'S COULOMB FIELD IN A DIELECTRIC LIQUID
A. Hummel and P. P. Infelta (Carnegie-Mellon Univ., Pittsburgh) [1972] 15 p refs Submitted for publication
(IRI-133-72-14) Avail: NTIS HC $4.00

The diffusion movement of two oppositely charged ions in each other's field in a dielectric liquid was studied. Several boundary conditions were introduced and the lifetime distributions for each of them was calculated. ESRO

N74-33039 Israel Program for Scientific Translations, Ltd., Jerusalem.
RADIOACTIVE ISOTOPES OF EUROPIUM PRODUCED BY NUCLEAR BLASTS
S. V. Iokhelson, I. M. Nazarov, F. Ya. Rovinskii, V. P. Chirkov, and E. I. Yushkam *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 37-39 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33042 Israel Program for Scientific Translations, Ltd., Jerusalem.
RATE OF ATMOSPHERIC FALLOUT OF CESIUM-137 AND STRONTIUM-90 AEROSOLS
A. S. Zykova, E. L. Telushkina, V. P. Rublevskii, G. P. Efremova, and G. A. Kuznetsova *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 57-60 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33052 Israel Program for Scientific Translations, Ltd., Jerusalem.
STATE OF STRONTIUM-90, CESIUM-137, AND CERIUM-144 IN RADIOACTIVE FALLOUT
F. I. Pavlotskaya, R. Surotkevichiene, and G. P. Levina *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 111-117 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. No. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33073 Israel Program for Scientific Translations, Ltd., Jerusalem.
DEVELOPMENT OF A METHOD FOR DETERMINING THE SIZE DISTRIBUTION OF RADIOACTIVE AEROSOLS WITH THE AID OF FILTERING MATERIALS
B. I. Ogorodnikov, E. A. Sitalo, V. I. Skitovich, and I. E. Konstantinov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 255-258 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33076 Israel Program for Scientific Translations, Ltd., Jerusalem.
SEPARATE DETERMINATION OF Rn, RaA, RaB AND RaC CONCENTRATIONS IN AIR FROM THE ALPHA-ACTIVITY DECAY CURVE OF A FILTER
V. N. Bakulin and B. G. Starikov *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 279-285 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

N74-33077 Israel Program for Scientific Translations, Ltd., Jerusalem.
NEW METHODS OF MEASURING Rn-220 (THORON) EXHALATION AND SOME RESULTS
B. I. Styro, T. N. Nedvetskaite, and E. E. Senko *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 286-292 refs Transl. into ENGLISH from Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N74-33165# Maryland Univ., College Park. Mechanical Engineering Dept.
PREIONIZATION IN A MAGNETOPLASMADYNAMIC GENERATOR
William R. Owens 2 Aug. 1974 37 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal on Feb. 1975 Sponsored in part by NSF
Avail: NTIS HC $5.00

A two-dimensional analytical model was developed to parametrically analyze the plasma and channel characteristics that affect preionization for a single pair of Faraday type electrodes located in a constant area channel. The plasma is divided into two regions: (1) a quasi-neutral bulk plasma, and (2) a sheath region separating the bulk plasma from insulating walls and electrodes. The nonlinear coupled electron continuity equation, electromagnetic field equation, and the electron energy equation are written in terms of finite differences which are numerically solved on a digital computer using an iterative relaxation technique. Author

N74-33166# Sydney Univ. (Australia). Dept of Mechanical Engineering.
COMPARISON OF ARGON AND URANIUM PLASMA TRANSPORT PROPERTY SOLUTIONS
E. L. Kane [1974] 26 p refs Presented at the 9th Ann. AINSE Plasma Phys. Conf., 12-14 Feb. 1973
(NP-19955) Avail: AEC Depository Libraries HC $3.50

A theoretical discussion is presented of the experimental data obtained by the measurement of the electrical and thermal conductivity in a wall-stabilized uranium arc, employing argon or helium as a cover gas. An outline of the full mathematical model that is under development is given, together with numerical transport property results for separate, singly ionized uranium and argon gases at one atmosphere and temperatures ranging from 4000 to 14,000K. Several comparative methods for the calculation of electrical conductivity, as well as viscosity, are employed. Author (NSA)

N74-33167# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Physique du Plasma et de la Fusion Controlee.
PROBLEMS AND NUMERICAL METHODS IN VERY HIGH TEMPERATURE PLASMA PHYSICS
C. Mercier, J. C. Adam, Soubbaramayer, and J. L. Soule Oct. 1973 44 p refs In FRENCH Presented at the Intern. Colloq. on Sci. and Tech. Calculation Methods, Rocquencourt, France, 17-21 Dec. 1973
(EUR-CEA-FC-708) Avail: AEC Depository Libraries HC $4.25

The chief methods used for the numerical study of plasmas at very high temperatures are presented (Vlasov equation and Lagrangian models). One-dimensional models for weak turbulence were tested in a large number of numerical experiments. Qualitative results predicted by theory have been reestablished in this way. Many theoretically predicted microinstabilities, which have never been experimentally observed, were observed in these numerical simulations. In the field of strong turbulence, studies of the double beam instability, which cannot be treated theoretically, were conducted in a detailed manner. One-dimensional models are, however, too restrictive to be used in studies of confined plasmas. In particular, studies of the transport coefficients necessitate two- and three-dimensional models. NSA

N74-33168# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
EXPERIMENT ON THE INTERACTION BETWEEN A PLASMA AND A NEUTRAL GAS 2
Lars Danielsson Feb. 1974 48 p refs Sponsored by the Swed. Atomic Res. Council
(TRITA-EPP-74-03) Avail: NTIS HC $5.50

The interaction between a plasma and a neutral gas in relative motion was demonstrated. If the relative velocity is high enough the interaction leads to heating of the electrons, partial ionization of the gas, and braking of the motion. The limiting velocity was found to be very close to Alfven's critical velocity. Measurements on the polarization of emitted spectral lines have yielded information on the velocity distribution of the electrons. Evidence is also presented on the electron heating and the necessity of a magnetic field for the interaction to take place. Previously observed minimum gas density is also discussed. Author (ESRO)

N74-33169# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Electron Physics.
A TEST OF A PROPOSED LOW PRESSURE DISCHARGE THEORY
S. Torven Mar. 1974 19 p refs
(TRITA-EPP-74-09) Avail: NTIS HC $4.00

It was proposed that limitation of the steady electric current in a low pressure arc plasma is associated with the maximum electron number density predicted by applying the Tonks-Langmuir integral equation for the radial electric field to a strongly ionized plasma column. This equation was investigated for large ionization degrees not covered by earlier numerical investigations. Excepting very low gas pressures, theoretically predicted limiting values were found to disagree with recently published experimental investigations on formation of current limiting space charge sheaths in a mercury plasma, and no explanation of current limitation seems to exist within the frame of the Tonks-Langmuir theory. The physical basis of this theory is discussed, and it is concluded that more general models for the ion motion are necessary to describe a strongly ionized plasma. Author (ESRO)

N74-33170# Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).
ARC DISCHARGES IN A CURVED MAGNETIC FIELD Ph. D. Thesis - Utrecht Univ.
F. C. Schueller Jun. 1974 148 p refs Sponsored in part by Neth. Organ. for Pure and Sci. Res. (ZWO) and EURATOM
(Rept-74-83) Avail: NTIS HC $10.50

An experiment on arc discharges in hydrogen in a curved magnetic field is described. For a few milliseconds the discharge current flowed between two electrodes along the field lines of a toroidal magnetic field over an angle of 258 deg. The plasma was not only confined by the poloidal magnetic field induced by

the discharge current itself, but also by a diamagnetic poloidal current. This current was driven mainly by the ambipolar diffusion of charged particles across the magnetic field and partially by the temperature gradient perpendicular to the magnetic field, the so-called Nernst-Ettinghausen effect. ESRO

N74-33171# Harry Diamond Labs., Washington, D.C.
EFFECT OF THERMAL BOUNDARY LAYER ON RF MEASUREMENT OF PLASMA PARAMETERS
Abraham Singer and Jan M. Minkowski Jan. 1974 12 p refs
(AD-780846; HDL-TR-1658) Avail: NTIS CSCL 20/9

A fundamental limitation in microwave measurement of plasma parameters is established: It is shown that it is not possible to determine experimentally such plasma parameters as electron temperature, electron density, or collision frequency by means of a microwave system operating at a frequency well below the plasma frequency because the plasma boundary layer exerts a prominent effect on the measurements. A numerical example is given, using published results for argon.
Author (GRA)

N74-33172# Systems Science and Software, La Jolla, Calif.
A STUDY OF EQUATIONS OF STATE/OPACITY OF IONIZED GASES Final Report, 31 Oct. 1971 - 21 Oct. 1972
Howard Cohen, Robert Vik, Ira Katz, and James Harvey May 1974 153 p refs
(Contract DNA001-72-C-0073; DNA Proj. NWED-PA010-12)
(AD-781824; SSS-R-72-1396; DNA-3061F-1) Avail: NTIS CSCL 20/9

Modifications have been made to the CAPO code for calculating the equation of state and opacities of plasmas. CAPO results have been used to calculate emission properties of a laser heated magnetically contained plasma. A new program, DANA, has been written which calculates the group average opacities of CAPO output. Author (GRA)

N74-33173# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
INFLUENCES OF COULOMB COLLISIONS ON THE SPECTRA OF COLLECTIVE SCATTERED RADIATION FROM FULLY IONIZED PLASMAS
M. Niimura and P. W. Chan Sep. 1973 103 p refs
(Contract F19628-70-C-0035; AF Proj. 7260)
(AD-781177; AFCRL-TR-73-0615; SR-7) Avail: NTIS CSCL 20/9

Complete profiles of the Coulomb-collision corrected scattered spectrum of the ion central lines from near ion-acoustic resonances to zero frequency shift and those of the electron-plasma lines have been computed for a fully and singly ionized plasma with equal electron and ion temperatures in the absence of an external magnetic field. The numerical calculations presented here are primarily based on the theoretical works of DuBois et al. The results are compared with those predicted by the collisionless plasma theory. (Modified author abstract) GRA

N74-33174# Army Foreign Science and Technology Center, Charlottesville, Va.
SCIENTIFIC SEMINAR ON ENERGY EXCHANGE IN PLASMA DEVICES
I. G. Panevin 26 Jul. 1973 4 p Transl. into ENGLISH from Fiz. Khim. Obrab. Mater. (USSR), no. 3, 1973 p 156-157
(AD-781223; FSTC-HT-23-1832-73) Avail: NTIS CSCL 20/9

An approximate method for calculating the characteristics of a thermocathode working in contact with a plasma medium under moderate pressure is reported, and the experimental characteristics of a heavy-current thermocathode of thoriated tungsten in an argon plasma at atmospheric pressure are examined. Author

N74-33175# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NEAR-ELECTRODE PROCESSES IN PLANE HALL FLOWS OF GOOD CONDUCTING PLASMA
A. I. Morozov and A. P. Shubin 17 Jun. 1974 15 p refs Transl. into ENGLISH from the book "Plazmennye Uskoriteli" USSR, 1973 p 261-267
(FTD Proj. T74-04-03)
(AD-781659; FTD-HT-23-1092-74) Avail: NTIS CSCL 20/9

The characteristics of the plasma flow pattern and distribution of fields and currents in the channel of a stationary heavy-duty accelerator with solid electrodes are discussed. The multidimensionality of the flow pattern and the near-electrode effects are a result of the influence of the Hall effect on the distribution of the electromagnetic fields in the plasma flow and the matching of these fields with boundary conditions at the electrodes and at the channel walls. The dynamics of the plasma flow are described in the approximation of two-liquid magnetic hydrodynamics. The conductivity of plasma and electron inertia are analyzed for a solution to the problem of the matching of fields. Author

N74-33176# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE USE OF PLASMA ACCELERATORS IN SPACE RESEARCH
I. M. Podgornii 17 Jun. 1974 16 p refs Transl. into ENGLISH from Plazmennye Uskor. (USSR), 1973 p 41-47
(AD-781662; FTD-HT-23-1045-74) Avail: NTIS CSCL 20/9

The creation of an artificial solar wind by using a coaxial electrodynamic plasma accelerator with pulsed gas admission is discussed. The required parameters of capacitor battery capacitance, voltage at the electrodes, and amplitude and time characteristics of the pulse fed to the hydrogen accelerator were determined experimentally. The experiments made it possible to reproduce the form of the earth magnetosphere including the geomagnetic tail, the collisionless shock wave, and a number of other phenomena. The areas of application of the electrodynamic accelerator are defined. Author

26 PHYSICS, SOLID STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N74-33177 Commissariat a l'Energie Atomique, Grenoble (France). Lab. Electronique Physique Appliquee.
SPECIFIC EFFECTS OF VO2 THIN FILM DEPOSITION ON THE METAL-SEMICONDUCTOR TRANSITION Final Report [ETUDE DES EFFETS SPECIFIQUES DU DEPOT EN COUCHES MINCES DE VO2 SUR LA TRANSITION SEMICONDUCTEUR-METAL]
A. Chenevas-Paule 22 Aug. 1973 46 p refs In FRENCH
(Contract DGRST-72-7-0559)
Avail: Issuing Activity

A study of physical and physico chemical properties in VO2 thin films is presented. The films are obtained by cathodic pulverization. The transition itself was studied with regard to resistivity variation vs temperature, reflectivity variation vs temperature, and diffraction and electronic image vs temperature. The characterization of the semi-conducting and metallic phases was studied using resistivity and thermoelectric capabilities, reflection and transmission spectrophotometery, ionic analysis, transmission, and reflection electron microscopy at 100 KeV. Quantities of interest were substrate nature influence on film crystallography and purity, influence of deposition parameters during the reactive cathodic pulverization, influence of controlled atmosphere annealing for simulation of multilayer structures, and phase characterization under applied electric field using an intermediate electrolyte. Results are interpreted. ESRO

N74-33178 Centre National d'Etudes des Telecommunications, Lannion (France).
POSSIBLE RELATIONSHIPS BETWEEN SYNTHETIC QUARTZ TRANSFORMATION TEMPERATURE,MEASURED BY DIFFERENTIAL THERMAL ANALYSIS, THE ABSORPTION COEFFICIENT BETWEEN 3800/cm AND 3500/cm, AND THE OVERVOLTAGE COEFFICIENT Final Report [RELATIONS POUVANT EXISTER ENTRE LA TEMPERATURE DE TRANSFORMATION DU QUARTZ SYNTHETIGUE MESUREE PAR ANALYSE THERMIQUE DIFFERENTIELLE, LE COEFFICIENT D'ABSORPTION ENTRE 3800/cm ET 3500/cm ET LE COEFFICIENT DE SURTENSION]
A. Regreny, M. Passaret, and P. Burlet Dec. 1973 26 p refs

In FRENCH ENGLISH summary
Avail: Issuing Activity

Different synthetic quartz crystals were examined by differential thermal analysis. Variations were observed in the alpha-beta inversion temperature. They were related to the presence of different growing zones in a crystal or, for the same zones, to growing conditions. It is possible to obtain indications of the quartz quality (overvoltage coefficient) from the knowledge of the transition temperature. ESRO

N74-33179*# North Carolina Agricultural and Technical State Univ., Greensboro. Dept. of Electrical Engineering.
METALLIC OXIDE SWITCHES USING THICK FILM TECHNOLOGY
Dalpat N. Patel and Leo. Williams, Jr. 1974 11 p refs Proposed for presentation at the Intern. Symp. of the Intern. Soc. for Hybrid Microelectronics (ISHM), Boston, 21-23 Oct. 1974
(Grant NGR-34-012-004)
(NASA-CR-140025) Avail: NTIS HC $4.00 CSCL 20L

Metallic oxide thick film switches were processed on alumina substrates using thick film technology. Vanadium pentoxide in powder form was mixed with other oxides e.g., barium, strontium copper and glass frit, ground to a fine powder. Pastes and screen printable inks were made using commercial conductive vehicles and appropriate thinners. Some switching devices were processed by conventional screen printing and firing of the inks and commercial cermet conductor terminals on 96% alumina substrates while others were made by applying small beads or dots of the pastes between platinum wires. Static, and dynamic volt-ampere, and pulse tests indicate that the switching and self-oscillatory characteristics of these devices could make them useful in memory element, oscillator, and automatic control applications. Author

N74-33180*# Radio Corp. of America, Princeton, N.J.
DESIGN, PROCESSING, AND TESTING OF LSI ARRAYS FOR SPACE STATION Quarterly Technical Report, 1 Apr. - 30 Jun. 1974
W. C. Schneider Jul. 1974 16 p refs
(Contract NAS12-2207)
(NASA-CR-120444; PRRL-74-CR-53; QTR-14) Avail: NTIS HC $4.00 CSCL 20L

The development of a beam-leaded low power, high performance metal-oxide-semiconductor (MOS), 256-bit random access memory (RAM) was reported. Previous success with the aluminum-gate current-sense version and a silicon-gate voltage-sense version led to the present effort to make a beam-leaded silicon-gate RAM. Some problems unique to the silicon-on-sapphire beam-lead process development are presented. Beam-leaded SOS TA5388 devices using a Si3N4 passivation layer were shown to have good electrical parameters. Author

N74-33181# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Energiewandlung und Elektrische Antriebe.
SURFACE PHENOMENA IN THERMIONIC RESEARCH [OBERFLAECHENPHYSIKALISCHE PROBLEME DER THERMIONIK]
R. Henne, ed. 16 Aug. 1973 146 p refs Partly in ENGLISH and partly in GERMAN Conf. held at Stuttgart, 30 Nov. - 1 Dec. 1972
(DLR-Mitt-73-29) Avail: NTIS HC $10.50; DFVLR, Porz, West Ger. 51.60 DM

Recent developments in work function theory and measurements are reported. The work function of uncovered metal surfaces is dealt with, and the influence of adsorbed electropositive elements (Cs, Sr) on work function is shown. The co-adsorption of electropositive (Cs, Sr, Ba) and electronegative (O2) elements and their influence on work function of different surfaces are discussed. The development of Sr-Cs alloys, for atmosphere generation of a Sr-Cs converter by means of a single reservoir, is described. For individual titles, see N74-33182 through N74-33190.

N74-33182 Stuttgart Univ. (West Germany). Inst. fuer Kernenergetik.
INVESTIGATION OF THE EMISSION CONSTANTS OF METALLIC BAND MATERIALS [UNTERSUCHUNG DER EMISSIONSKONSTANTEN METALLISCHER HARTSTOFFE]
G. Haufler *In* DFVLR Surface Phenomena in Thermionic Res. 16 Aug. 1973 p 11-23 refs In GERMAN (For availability see N74-33181 22-26)

The emission constants phi and A (sub R) were systematically investigated for pressed sinter samples of binary and ternary transition metal-nonmetal systems with 4a and 5a metals. The characteristic behavior in the different systems was pointed out. The results were analyzed with respect to the energy band structure of these hard materials. From the systematics found, conclusions may be drawn for the warranty of steady operating conditions of metal cathodes, as well as for the development of new types of cathode materials based on metallic hard materials. ESRO

N74-33183 Kernforschungsanlage, Juelich (West Germany). Inst. fuer Technische Physik.
WORK FUNCTION DEPENDENCE ON CRYSTAL ORIENTATION FOR TUNGSTEN
B. Krahl-Urban and H. Wagner *In* DFVLR Surface Phenomena in Thermionic Res. 16 Aug. 1973 p 25-34 refs (For availability see N74-33181 22-26)
Avail: NTIS

Work function measurements on planar tungsten single crystal samples were performed by thermionic emission. Apparent work function values and apparent emission constants were obtained for various orientations between the (100) and the (110) direction. For the (110) direction and three well defined directions tilted about 5 degrees from the (110) direction work function values were determined by using the Richardson-Dushman equation and the Richardson constant. The comparsion between the work function values of the (110) direction with those of the three neighboring directions may be of value with regard to the preparation of CVD-chloride tungsten layers.
Author (ESRO)

N74-33184 Stuttgart Univ. (West Germany). Inst. fuer Kernenergetik.
ELECTRON EMISSION POLYCRYSTALLINE SURFACE IN THE CESIUM CONVERTER [ELEKTRONENEMISSION POLYKRISTALLINER OBERFLAECHEN IM CAESIUMKONVERTER] c03
E. Maier and H. Otten *In* DFVLR Surface Phenomena in Thermionic Res. 16 Aug. 1973 p 37-50 refs In GERMAN (For availability see N74-33181 22-26)

The electron emission current densities of three polycrystalline emitters, a tantalum emitter and two emitters with a CVD tungsten layer on tantalum, were determined. A cesium converter was used from the 1-V characteristics in the surface ionization range of emitter temperatures between 1700 K and 1900 K and a cesium vapor pressure between 0.05 torr and 6 torr. These emission current densities were compared with the calculated ones. The calculation was based on the plane contributions of several crystal zones at the emitter surface determined by X ray diffraction. Comparison of experiment and calculation provided an excellent agreement for all three emitters. ESRO

N74-33185 Provence Univ., Marseille (France). Lab. de Photoelectricite.
WORK FUNCTION CHANGE OF POLYCRYSTALLINE TUNGSTEN WITH STRONTIUM ADSORPTION c03
J. P. David, J. L. Denisot, F. Floret, and G. Kassibrakis *In* DFVLR Surface Phenomena in Thermionic Res. 16 Aug. 1973 p 53-67 refs (For availability see N74-33181 22-26)

In order to improve the efficiency of cesium vapor thermionic converters, a two-vapor converter containing Cs ans Sr was investigated. The working principle is to separate the functions of the alkaline vapor, using space charge neutralization by cesium, and decrease of the emitter work function down to the value allowing optimal electron emission by strontium. Preliminary experimental results are presented. ESRO

N74-33186 Commissariat a l'Energie Atomique, Saclay (France).
CO-ADSORPTION OF CESIUM, STRONTIUM AND OXYGEN ON (100) TUNGSTEN c03
J. L. Desplat and J. L. Denisot *In* DVLR Surface Phenomena in Thermionic Res. 16 Aug. 1973 p 69-81 refs (For availability

see N74-33181 22-26)

A survey of activity in the field of work function problems applied to thermionics is presented. Co-adsorption of cesium and oxygen was studied at room temperature by means of work function and Auger spectroscopy measurements. The emission properties of co-adsorbed layers were investigated using a thermionic electron emission microscope. ESRO

N74-33187 Stuttgart Univ. (West Germany). Inst. fuer Physikalische Elektronik.

WORK FUNCTION MEASUREMENTS WITH AN IMPROVED FEM OF O2 AND Cs COVERED W- AND Mo-CATHODES **c03**

Rudolf Maly *In* DFVLR Surface Phenomena in Thermionic Res. 16 Aug. 1973 p 83-102 refs (For availability see N74-33181 22-26)

An improved field emission microscopi (FEM) for probe hole measurements and a convenient method for the evaluation of probe hole data were developed during studies of co-adsorption of oxygen on tungsten and oxygen and/or cesium on molybdenum. An arbitrary plane can be chosen for examination by means of a manipulator. The work function is derived from the function of field emission current density versus time by a special evaluation method. Time required for measuring and evaluating FEM data is considerably reduced, and an improvement in accuracy is achieved as compared to the conventional method of drawing FN-plots. The FEM, the method of evaluation, and some characteristic data obtained by this technique are presented. Author (ESRO)

N74-33188 Karlsruhe Univ. (West Germany). Inst. fuer Angewandte Physik.

LEED INVESTIGATION OF THE Cs/O/W(100) ADSORPTION SYSTEM [LEED-UNTERSUCHUNG AM Cs/O/W(100)-ADSORPTIONSSYSTEM]

H. Jakusch *In* DFVLR Surface Phenomena in Thermionic Res. 16 Aug. 1973 p 103-115 refs In GERMAN; In GERMAN; ENGLISH summary (For availability see N74-33181 22-26)

Oxygen forms five different adsorption structures on the W(100)surface. On the thermally most stable one, the 2x1-O/W structure, the adsorption properties were studied. In this case, various ordered Cs-phases are formed, for which the formation temperature, coverage, and work function change were measured. The binding energy of Cs is estimated from adsorption isobars. Three different binding states show up, which are also verified by the desorption spectra. Two of these can be associated with ordered, one with an unordered Cs-structure. A comparison of these results with others obtained on the facetted O/W-structure shows the strong influence of the substrate on the Cs-adsorption. Author (ESRO)

N74-33189 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Energiewandlung und Elektrische Antriebe.

LOCAL THERMIONICS EMISSION FROM COVERED SURFACES OF ELECTRODES [LOKALE THERMISCHE ELEKTRONENEMISSIONEN UNTER DEM EINFLUSS VON SAUERSTOFF UND BARIUMDAMPF] **c03**

D. Schmidt *In its* Surface Phenomena in Thermionic Res. 16 Aug. 1973 p 117-128 In GERMAN; ENGLISH summary (For availability see N74-33181 22-26)

The operating conditions of thermionic converters strongly depend on the oxygen and barium content of the atmosphere in the interelectrode gap. Some of the effects that occur under such conditions at the surface of hot electrodes can be shown by pictures on the screen of an emission microscope. The influence of the partial pressure of additives was demonstrated by a covered cermetelectrode composed of spheres of uranium dioxide embedded in a molybdenum sponge and by a sample of polycristalline molybdenum. Similar features could be realized by high partial pressure added for a short period of time or by lower partial pressure added for a longer period of time. Author (ESRO)

N74-33190 Ecole Superieure de Chimie, Mulhouse (France). Lab. de Chimie Minerale Appliquee.

VAPOR-PRESSURES ABOVE STRONTIUM-CESIUM ALLOYS **c09**

C. Oberlin and P. Strobel *In* DFVLR Surface Phenomena in Thermionic Res. 16 Aug. 1973 p 129-140 refs (For availability see N74-33181 22-26)

In connection with work on atmosphere generation for a Sr-Cs converter, the development of Cs and Sr alloys, satisfying the conditions of thermionic conversion, is reported. The compounds used are essentially those of Al and Sn. Vapor pressure measurements of Cs and Sr above such alloys led to the realization of two new measuring devices. The first measurements of vapor pressure on the pure metals Cs and Sr were carried out. They allow the calibration of the chosen measurement methods, and the determination of vapor pressures above alloys enabling the realization of diodes with two alkali metals. ESRO

N74-33191# Commissariat a l'Energie Atomique, Saclay (France).

PROGRAMME ON APPLICATION OF SUPERCONDUCTIVITY IN FRANCE

G. Bronca 3 Sep. 1973 11 p Presented at the Advan. Study Inst. on Large Scale Appl. of Superconductivity and Magnetism, Entreves, Italy, 5-14 Sep. 1973

(CEA-Conf-2522; Conf-730970-1) Avail: AEC Depository Libraries HC $3.00

A program on large scale applications of superconductivity to be funded by the government was established in France. It is oriented towards two main applications. For the near future, support of nuclear physics magnets research which will be applied in the coming years, it will be a good preparation for future other applications. For the far future, support of research for turbogenerators, the use of which is forecast about 1985. The other applications do not appear now very promising in our country but work will be done in two fields which will be useful for any applications namely the conductor and the cryogenic supply. Author (NSA)

N74-33192# Commissariat a l'Energie Atomique, Grenoble (France).

CHEMICAL REACTIONS AND MASS TRANSPORT PROCESSES IN DONOR AND ACCEPTOR DOPED Al2O3 CRYSTALS

R. T. Cox 1973 11 p refs Presented at the Conf. on Lattice defects in Ionic Crystals, Marseille, 2 Jul. 1973

(CEA-CONF-2448; Conf-730715-3) Avail: AEC Depository Libraries HC $3.00

Information about the chemical and transport properties of point defects in Al2O3 is given. Data were obtained by ESR and optical spectroscopic studies of the oxidation and reduction of crystals which were doped with the donor impurity titanium or the acceptor impurity magnesium. Gamma irradiation is involved in one of the treatments. Author (NSA)

N74-33193# California Inst. of Tech., Pasadena. W. M. Keck Lab. of Engineering Materials.

SUPERCONDUCTIVITY IN METAL-SEMICONDUCTOR EUTECTIC ALLOYS AEC Research and Development Report

C. C. Tsuei and W. L. Johnson Mar. 1974 40 p refs

(Contract AT(04-3)-822)

(CALT-822-59) Avail: NTIS HC $5.00

In an eutectic alloy obtained by melting the constituents, alternating domains of metal and semiconductor can exist in a well defined microscopic array. The possibility of superconductivity arising from an interface interaction between the metal and semiconductor has been investigated. Superconductivity has been observed as a bulk property of some eutectic alloys (e.g., Al-Si and Al-Ge). Transition temperatures (T) well in excess of those for the pure metal were found. The effect of rapid-cooling the alloys from the liquid state on the microstructure, and on the superconducting properties has been studied. It was found that a decrease in the characteristic domain sizes of the metal and semiconductor was accompanied by an increase of the superconducting transition temperature of the alloy. The results suggest that the enhancement of T depends on the Fermi energy of the metal. In metal-metal eutectic systems with comparable microstructure, no increase of T was observed. Author (NSA)

N74-33194# Stuttgart Univ. (West Germany).

DEFECT STRUCTURES IN SOLID BODIES, 1971 - 1974 [DEFEKTSTRUKTUREN IN FESTEN STOFFEN WIS-

SENSCHAFTLICHER BERICHT, 1971 - 1974]
H. Seidel, ed. Apr. 1974 239 p refs In GERMAN
Avail: NTIS HC $15.00

Projects and subprojects carried out or in progress at the special research group on solids are reported for the period 1971-1974. The objective of this research group is the investigation of defects, zero-dimensional centers for local states in molecular crystals, ionic crystals, and semiconductors. ESRO

N74-33195# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DIFFUSION OF SCANDIUM IN SINGLE CRYSTAL ALUMINUM OXIDE M.S. Thesis
James E. Dockendorff Mar. 1974 60 p refs
(AD-780626; GAW/MC/74-4) Avail: NTIS CSCL 20/12

The diffusion of scandium in single crystal aluminum oxide was studied using the Sc46 isotope as a radiotracer. An improved Gruzin method was used to determine the diffusion coefficients at various temperatures and oxygen partial pressures. The temperatures ranged between 1110C and 1465C. The oxygen partial pressures were 1 atmosphere and .0001 atmospheres. The dependence of the diffusion coefficient upon oxygen partial pressure was investigated to determine the type of mechanism controlling the diffusion of scandium in aluminum oxide. The dependence was observed to be very small. This tended to favor the Frenkl defect (formation of aluminum ion interstitials) mechanism as the primary controlling mechanism of the diffusion. (Modified author abstract) GRA

N74-33196# California Univ., Irvine. Dept. of Physics.
THEORY OF SURFACE MAGNETOPLASMONS IN LEAD CHALCOGENIDES Final Report
J. J. Brion and R. F. Wallis Jun. 1974 44 p refs
(Contract N00014-69-A-0200-9003; NR Proj. 015-731)
(AD-781142; TR-73-51) Avail: NTIS CSCL 20/12

A previously developed theory of surface polaritons is used to calculate the surface magnetoplasmon modes for materials with anisotropic energy surfaces such as the lead chalcogenides and n-type germanium. These materials are characterized by a Fermi surface consisting of prolate spheroids with axes in the (111) symmetry directions. Results are compared to the surface magnetoplasmon modes in substances having a spherical Fermi surface. Specific calculations are made for p-type PbTe with the external magnetic field parallel to the (100) and (110) directions, with the surface parallel to and perpendicular to the magnetic field. Retardation is included for the case of the magnetic field parallel to the surface and the direction of propagation normal to the field. Author (GRA)

N74-33197# Westinghouse Research Labs., Pittsburgh, Pa.
INVESTIGATION OF FLUX PINNING AND CRITICAL CURRENT DENSITIES IN TYPE 2 SUPERCONDUCTORS Technical Report, 1 Jul. 1973 - 30 Jun. 1974
Daniel W. Deis, Mahendra P. Mathur, Martin Ashkin, and Clifford K. Jones 20 Jun. 1974 53 p refs
(Contract N00014-73-C-0026; NR Proj. 039-116)
(AD-780903; Rept-74-9J2-FLPIN-R1-TR-2) Avail: NTIS CSCL 20/2

Magnetization measurements, M(H,T) were made on a series of Nb and NbTi multifilament conductors as well as a series of heat treated monofilament Nb-25%Zr conductors. From these measurements the pinning force (F sub p) (H,T) and the critical current characteristics, (J sub c)(H) are deduced for all samples. The scaling law theory of flux pinning was found to be valid, in general, for all these materials. Metallurgical examinations have been made on the Nb-Zr samples to relate heat treatment, J sub c and microstructure. Author (GRA)

N74-33198# Advanced Research Projects Agency, Arlington, Va.
NONCRYSTALLINE SEMICONDUCTORS: ELECTRICAL AND THERMAL PROCESSES Final Report
Lyle H. Slack 1 Jun. 1974 15 p refs
(Grant DA-ARO(D)-31-124-72-G72; ARPA Order 1562)
(AD-780706) Avail: NTIS CSCL 20/2

The worldwide scientific quest for an understanding of the switching phenomenon in amorphous semiconductor films faced a controversy as to whether it was a thermal or electronic process. A practical concern about the stability of chalcogenide switching devices prompted switching studies in the more stable oxides. These include oxides from the Bi2O3.ZnO.MnO ternary system and the V2O5.P2O5 binary. A basic study compared the electronic spectra, structures, and electrical characteristics of several crystalline and noncrystalline semiconductors. A new technique for the preparation of oxide films was developed. GRA

N74-33199# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STRONGER THAN DIAMOND
A. Khandros 16 Apr. 1974 18 p Transl. into ENGLISH from Rabochaya Gaseta (USSR), no. 186, 10 Aug. 1972 p 3
(AD-779810; FTD-HT-23-1859-74) CSCL 20/2

The paper describes the history of synthetic diamond growth in the U.S.S.R. GRA

N74-33200# International Business Machines Corp., Hopewell Junction, N.Y. East Fishkill Lab.
CRYSTAL PROPERTIES AS INFLUENCED BY CRYSTALLOGRAPHIC IMPERFECTION CADMIUM TELLURIDE, 1 APRIL 1972 - 30 JUNE 1973
Guenter H. Schwuttke 1 Nov. 1973 82 p refs
(Contract F19628-72-C-0274; AF Proj. 5621)
(AD-779801; AFCRL-TR-74-0061; SR-1) Avail: NTIS CSCL 20/12

The report consists of two parts. Part 1 reports a chemical-mechanical approach for generating damage-free and highly specular surfaces on single crystal and polycrystalline cadmium telluride and zinc selenide. The polishing agent is a clear solution of potassium bromide, sodium hypochlorite, sodium carbonate and water. Polishing is achieved by forming a reaction product on the primary surface, removing the reaction product, and exposing a new and fresh primary surface for continuing chemical action. Large perfect surfaces are thus obtained. Part 2 is concerned with the application of transmission electron microscopy, X-ray topography, and precision lattice parameter measurements to the characterization of cadmium telluride. New specimen preparation techniques were developed making the application of such techniques to the characterization of cadmium telluride possible. The defect structure of cadmium telluride crystals is resolved. Major defects are dislocation and tellurium inclusions. Measurement of lattice parameter, X-ray density, and thermal coefficient of expansion of CdTe are reported. Author (GRA)

N74-33201# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
MAGNETOSTATIC SURFACE WAVES IN FERRIMAGNETS ABOVE 4 GHz
James C. Sethares and J. Bradford Merry 28 Feb. 1974 27 p refs
(AF Proj. 5635)
(AD-780640; AFCRL-TR-74-0112; AFCRL-PSRP-587) Avail: NTIS CSCL 20/12

Microwave properties of magnetostatic surface waves in saturated ferrimagnets are described. Particular emphasis is given to experimental aspects of the subject. A summary background is given of pertinent experimental investigations of magnetostatic surface waves (MSSW) from 1968, when they were first observed, to the present. Certain features such as nonreciprocity, electronic tunability, and high coupling efficiencies are discussed. Propagation losses, between 4 and 15 GHz, on chemically-polished yttrium iron garnet (YIG) slabs were measured. Effects of inhomogeneous internal fields, the effects of placing metal conducting planes parallel to the surface upon which the waves propagate to modify the dispersion relation, and the effects of surrounding a single crystal slab (supporting resonant modes) with metal coated polycrystalline YIG to increase field homogeneity, are considered. Magnetostatic surface wave losses, above a few GHz, are less than those of acoustic surface waves. It is concluded that MSSW technology complements ASW technology at high frequencies. (Modified author abstract) GRA

N74-33202# Pennsylvania State Univ., University Park. Materials Research Lab.
FERRIC CRYSTALS FOR ELECTRO-OPTIC AND ACOUSTO-OPTIC APPLICATIONS Annual Report
L. E. Cross and R. E. Newnham 28 Jun. 1974 192 p refs

(Contract N00014-67-A-0385-0023)
(AD-780902) Avail: NTIS CSCL 20/12
Contents: Experimental studies on lead germanate Pb5Ge3O11; Elastic behavior of isopropyl ammonium chlorostannate (IPACS); New ferroelastic and ferroelastic-ferroelectric crystals for acousto-optic applications; Symmetry of ferric crystals. GRA

N74-33203# Princeton Univ., N.J. Device Physics Lab.
ELECTRON TRAPPING IN ION-IMPLANTED SILICON DIOXIDE FILMS ON SILICON
Noble M. Johnson, Walter C. Johnson, and Murray A. Lampert Jan. 1974 81 p refs Sponsored in part by DARPA
(Contract N00014-67-A-0151-0035)
(AD-781739; PU-DPL-TR-27; AFCRL-TR-74-0133; TR-1) Avail: NTIS CSCL 20/12
Photoelectric and MOS capacitance - voltage techniques were used to investigate the properties of electron traps created in SiO2 films by ion implantation. The samples consisted of MOS structures with either Al or Ne ions shallowly implanted into the oxide layer. Unannealed Al-implanted and Ne-implanted SiO2 films possessed much larger concentrations of electron traps than were found in unimplanted control samples. The trapping centers introduced by the ion implantation were acceptor-like in that they acquired negative charge after capturing an electron, thereby giving rise to positive flatband voltages. From the existence of electron traps in Ne-implanted oxides, and from a substantial reduction in electron trapping after thermal anneal of Al-implanted samples, it is concluded that a large proportion of the traps are associated with displacement damage created by the ion implantation. In both Al-implanted and Ne-implanted oxides, photodepopulation of the electron traps required photon energies above 4.0 eV. Author (GRA)

N74-33204# IBM Watson Research Center, Yorktown Heights, N.Y.
THE PHYSICS OF INTERFACE INTERACTIONS RELATED TO RELIABILITY OF FUTURE ELECTRONIC DEVICES Semiannual Technical Report
Thomas R. DiStefano and King-Ning Tu 31 Jul. 1973 102 p refs
(Contract F19628-73-C-0006)
(AD-781820; TR-2; AFCRL-TR-74-0194) Avail: NTIS CSCL 20/12
Contents: The reliability of semiconductor-insulator interfaces-(Impact ionization model for dielectric instability breakdown; Phosphorus precipitation on Si/SiO2 interfaces); Band structure and switching in insulators--(Optical properties of allotropic forms of SiO2; Structural transformations as observed by TEM during electrical switching in amorphous Ge-Te); Instabilities associated with metal-glass Interactions--(Analysis of thin film structures with nuclear backscattering and X-ray diffraction; Reactions of thin metal films with Si or SiO2 substrates). GRA

N74-33205# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A STUDY OF THE ETCHING CHARACTERISTICS OF SEMICONDUCTOR MATERIALS IN RF PLASMAS M.S. Thesis
James Dale Shy Jun. 1974 74 p refs
(AD-781831; GE/EE/74-35) Avail: NTIS CSCL 09/5
An experimental study was made on the use of plasma etching machines to etch semiconductor materials used in microcircuit fabrication processes. Plasmas were used to etch a number of materials to include phosphosilicate glass, silicon nitride, chemically vapor deposited silicon dioxide, epitaxially deposited silicon dioxide, and silicon. Etching characteristics of these materials were obtained in a variety of operating conditions ranging from variations of power from 0 to 400 watts, pressure from 0 to 0.50 torr, and gas flow from 0 to 500 cc per minute. The etching technique was then used to etch circuit wafers which were developed into microcircuits. Results demonstrated that the plasma etching process could be used in place of chemical etchants. Yield of usable devices from the circuit wafers varied from 10% to 70% per wafer; however, no damage was attributed to the plasma etching process. A limited investigation into the etching of multiple passivation layers was conducted but was not completed. (Modified author abstract) GRA

N74-33206# Dayton Univ. Research Inst., Ohio.
RESEARCH AND DEVELOPMENT ON CHARACTERIZATION OF ELECTROMAGNETIC MATERIALS Yearly Progress Report, 1 May 1972 - 30 Apr. 1973
Duane Early, Priscilla Franklin, Richard Harris, and Sara Stevens Feb. 1974 70 p
(Contract F33615-72-C-1666; AF Proj. 7360)
(AD-781802; UDRI-TR-74-05; AFML-TR-74-37) Avail: NTIS CSCL 20/12
Experimental work was conducted on the thermodynamic properties of several materials including samarium, cobalt, zinc-selenide, cadmium-telluride and mercury-cadmium-telluride. Isotopic intensities were determined on several isotopes and the results shown graphically. The second and third law thermodynamic properties were calculated from accumulated data and the tabulated results are included. Even though the thermodynamic properties of mercury-cadmium-telluride were not obtained, a discussion is given on some observations made during test runs and some interesting chemical analyses are shown. Several organic laser dye materials and liquid crystal materials were synthesized and investigated. The synthesis routes to these materials are detailed and the characterization results of the materials presented in tabular form. Author (GRA)

N74-33207# Illinois Univ., Urbana. Materials Research Lab.
MATERIALS SCIENCE RESEARCH Annual Technical Report, 1 Jul. 1973 - 30 Jun. 1974
Jul. 1974 198 p refs Sponsored in part by ARPA, AEC, ONR, AFOSR, and AROD
(Grant NSF GH-33634)
(AD-781676) Avail: NTIS CSCL 11/7
Brief summaries are given of the status and results of NSF, ARPA and AEC supported research programs at the University of Illinois Materials Research Laboratory. Areas discussed include cryogenics, crystallography, spectroscopy, metal physics, superconductivity, semiconductors, solid state physics, phase studies and radiation damage. GRA

N74-33208# Army Foreign Science and Technology Center, Charlottesville, Va.
A DEVICE FOR MEASURING THERMOELECTRIC AND THERMOMAGNETIC EFFICIENCY OF SEMICONDUCTORS
S. A. Supostat and B. G. Tikhomirov 3 May 1974 5 p ref Transl. into ENGLISH from the monograph "Nizkotemperaturnye Thermoelektricheskie Materialy" Kishinev, 1970 p 35-39
(AD-781247; FSTC-HT-23-2245-72) Avail: NTIS CSCL 20/12
The authors have designed a device for direct measurement of thermoelectric and thermomagnetic efficiency based on Harman's method and Harman's modified methods respectively, on which preliminary measurements were made. Research in a temperature range of 100-400K are possible. GRA

N74-33402* General Electric Co., Philadelphia, Pa.
CRYSTALS FOR SURFACE WAVE ACOUSTIC SUBSTRATES, APPENDIX C
Donald R. Ulrich *In its* Study for Identification of Benefical Uses of Space (BUS), Phase 2, Vol. 2, Book 2, Sect. 5 1 Nov. 1973 5 p refs Revised (For availability see N74-33399 22-34) CSCL 20B

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N74-33209* National Aeronautics and Space Administration. Pasadena Office, Calif.
PREPARING OXIDIZER COATED METAL FUEL PARTICLES Patent
John I. Shafer (JPL) and George M. Simmons, inventors (to NASA) (JPL) Issued 20 Aug. 1974 25 p Filed 2 Feb. 1973 Supersedes N73-17802 (11 - 08, p 0953) Sponsored by NASA

(NASA-Case-NPO-11975-1; US-Patent-3,830,673; US-Patent-Appl-SN-329243; US-Patent-Class-149-17; US-Patent-Class-149-60; US-Patent-Class-149-76) Avail: US Patent Office CSCL 21I

A solid propellant composition of improved efficiency is described which includes an oxidizer containing ammonium perchlorate, and a powered metal fuel, preferably aluminum or beryllium, in the form of a composite. The metal fuel is contained in the crystalline lattice framework of the oxidizer, as well as within the oxidizer particles, and is disposed in the interstices between the oxidizer particles of the composition. The propellant composition is produced by a process comprising the crystallization of ammonium perchlorate in water, in the presence of finely divided aluminum or beryllium. A suitable binder is incorporated in the propellant composition to bind the individual particles of metal with the particles of oxidizer containing occluded metal.
Official Gazette of the U.S. Patent Office

N74-33210# Bureau of Mines, Bartlesville, Okla. Energy Research Center.
ANALYSIS OF AVIATION GAS TURBINE FUELS Final Report
R. W. Hurn Dec. 1973 13 p refs
(Contract DOT-AS-20058)
(AD-774673; FAA-RD-73-189) Avail: NTIS HC $3.00

Experimental work was done to determine for aviation turbine fuels the trace components that could be source material of atmospheric pollutant. Data were obtained on both U. S. and European area fuels. Other analytical data were obtained for turbine exhaust gases and, concurrently, on the fuels used in producing the exhaust. The objective in the engine exhaust study was to correlate, if possible, the presence of fuel trace components and the appearance of such components in the aircraft emissions. Results of the study suggest that trace elements of fuels can be controlled at levels such that the fuel is not significant as a source of those elements as aircraft emissions. Author

N74-33211*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
STUDY AND DESIGN OF A CRYOGENIC PROPELLANT ACQUISITION SYSTEM Quarterly Report, 1 Oct. - 30 Dec. 1972
G. W. Burge and J. B. Blackmon 15 Jan. 1973 46 p refs
(Contract NAS8-27685)
(NASA-CR-120388; MDC-G4354; QR-6) Avail: NTIS HC $5.50 CSCL 21I

The development of an acquisition system for supplying subcooled liquid hydrogen and liquid oxygen under in-orbit conditions is discussed. The system will be applied to the integrated cryogenic feed requirements for space systems such as a space shuttle cryogenic auxiliary propulsion system (APS) and main propulsion for an advanced spacecraft propulsion module (ASPM). Concepts that use the favorable surface tension characteristics of fine mesh screens are emphasized. The specific objectives of the program are: (1) to evolve conceptual designs for candidate acquisition systems, (2) to formulate the analytical models needed to analyze the systems, and (3) to generate parametric data on overall candidate system performance, characteristics, and operational features in sufficient depth to establish critical design problems and criteria to support a sound system design and evaluation. Author

N74-33212# URS Research Co., San Mateo, Calif.
BLAST HAZARDS OF THE LIQUID PROPELLANTS LCO AND LN SUB2O Final Report
Chuck Wilton and A. B. Willoughby Jan. 1974 150 p refs
(Contract F04611-73-C-0053; AF Proj. 3234)
(AD-780638; URS-7309-12; AFRPL-TR-74-7) Avail: NTIS CSCL 21/9

A limited test program was conducted to obtain preliminary explosive yield data for the propellant combination of liquid carbon monoxide and liquid nitrous oxide, under conditions which simulate credible failure in a future test facility. During the course of the program ten tests were conducted using mixtures of these propellants in both liquid and gas phases and another five tests were conducted using mixtures of liquid of gaseous carbon monoxide and air. Propellant weights ranged from about 50 to 800 lbs. (Modified author abstract) GRA

N74-33213# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
EVALUATION OF THE EFFECTIVENESS OF ANTI-MIST FUEL ADDITIVES IN PREVENTION OF AIRCRAFT FUEL TANK ULLAGE FIRES AND EXPLOSIONS Technical Report, 1 Dec. 1972 - 15 Feb. 1973
Gregory W. Gandee and Robert G. Clodfelter Jan. 1974 22 p refs
(AF Proj. 3048)
(AD-781378; AFAPL-TR-73-111) Avail: NTIS CSCL 21/4

A series of vertical gunfire tests was conducted at Wright-Patterson AFB in order to assess the effectiveness of fuel additives in reduction of the fire and explosion hazards that can be associated with kerosine (JP8) fuel under gunfire conditions. This program considered commercial additives which have been developed for the fire-safe fuel efforts of the FAA, the Army, and the British Government. The additives were intended to prevent fuel mist or spray during a crash situation. This effort considered the effectiveness of these additives at a concentration of approximately 0.3% wt. in the prevention of explosions of fuel mist or spray as a 50 calibre armor piercing incendiary ordnance round passes through the liquid-vapor interface. Results indicated that additives could be effective. Two of the four materials reduced average pulse pressure rise to less than 10 psi as compared to 40 psi rise with neat JP-8. Additives were not effective when evaluated in JP-4 fuel. Author (GRA)

N74-33214# Thiokol Chemical Corp., Brigham City, Utah. Wasatch Div.
CHEMICAL AGING STUDIES ON ANB-3066 AND TP-H1011 PROPELLANTS Final Technical Report
L. H. Layton Jun. 1974 115 p refs
(Contract F04611-71-C-0026)
(AD-781198; TWR-74185; AFRPL-TR-74-16) Avail: NTIS CSCL 21/9

An accelerated aging study performed with ANB-3066 propellant shows that it conforms to the same aging law or model that describes the aging behavior for TP-H1011 propellant. The crosslinking reaction of imine from the curing agent and carboxyl from the polymer is shown to be essentially complete at the end of the cure period. Evidence also shows that the aging reaction may well be a crosslinking across double bonds in the polymer chains. Chemical and mechanical tests performed at periodic intervals after aging at 75, 95, 115, 135 and 150F have led to a better understanding of the aging process and have made predictions of future behavior possible. Curves showing a 10 year prediction for tensile stress, strain, and modulus have been included. Two special studies with TP-H1011 propellant have been made to determine the effects of strain and of a second or multistep aging condition on the aging rate. (Modified author abstract) GRA

N74-33215# Thiokol Chemical Corp., Brigham City, Utah. Wasatch Div.
MINUTEMAN STV STRESS ANALYSIS AND TESTING Final Report, 1 Dec. 1971 - 2 Jul. 1973
D. J. Danieu and V. L. Ruggles Jun. 1974 37 p refs
(Contract F04611-72-C-0015; AF Proj. 3059)
(AD-781381; TWR-7496; AFRPL-TR-74-27) Avail: NTIS CSCL 21/9

The report presents a theoretical stress analysis of OOAMA/RPL Motor S/N 0012257. The analysis involved predicting stresses induced by temperature cycling, temperature shock, and pressurization. The results reported represent a major step in the use of instrumented motors to verify the accuracy of modulus dependent predictions of rocket motor grain structural behavior. Author (GRA)

N74-33216# Thiokol Chemical Corp., Huntsville, Ala.
IMPROVED REPRODUCIBILITY OF SOLID ROCKET PROPELLANTS Final Report
D. A. Flanigan, S. L. Vance, and R. E. Askins 15 Dec. 1973 427 p refs
(Contract F04611-72-C-0067)
(AD-781804; AFRPL-TR-73-111; Rept-38-73) Avail: NTIS HC $9.00 CSCL 21/9

How variations in propellant ingredients affect mix-to-mix propellant burn rate and mechanical properties is defined. Source,

size, shape, and particle size distribution of ammonium perchlorate variations are studied. Techniques were developed through which any lot of ammonium perchlorate can be characterized in such a way that an exact definition of oxidizer blend is available for meeting precisely the burn rate and physical property requirements in processible CTPB and HTPB propellants. The techniques were confirmed in demonstration (five-gallon) mixes. Mechanical property and ballistic assessment of the technique's validity was accomplished. (Modified author abstract) GRA

N74-33217# Aerojet Solid Propulsion Co., Sacramento, Calif. Engineering Operations.
ASYMMETRIC GRAIN EVALUATION COMPUTER PROGRAM: ANALYSIS OF THREE MOTOR GRAIN CONFIGURATIONS
May 1974 134 p refs
(Contract DAAH01-74-C-0434; DA Proj. 1M3-62303-A-214) (AD-781527; ASPC-1163-GA-1) Avail: NTIS CSCL 21/9

The objective of this report is to present the results of using the modified grain evaluation computer program to evaluate three different propellant grain configurations having four general types of asymmetrics. The basic purpose of this task was to demonstrate capability and operational characteristics of the computer program. This objective is fulfilled by presentation of computer output data. GRA

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magneto-hydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N74-33218* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ABATING EXHAUST NOISES IN JET ENGINES Patent
Ira R. Schwartz, inventor (to NASA) Issued 20 Aug. 1974 25 p Filed 23 Mar. 1973 Supersedes N73-20826 (11 - 11, p 1334)
(NASA-Case-ARC-10712-1; US-Patent-3,830,431; US-Patent-Appl-SN-344410; US-Patent-Class-239-265.11; US-Patent-Class-181-33HC) Avail: US Patent Office CSCL 21E

A noise abating improvement for jet engines including turbojets, turbofans, turboprops, ramjets, scramjets, and hybrid jets is introduced. A provision is made for an apparatus in the primary and/or secondary flow streams of the engines; the apparatus imparts to the exhaust gases a componet rotation or swirl about the engine's longitudinal axis. The rotary component in the exhaust gases causes a substantial suppression of sound energy build up normally produced by an axial flow exhaust system. Official Gazette of the U.S. Patent Office

N74-33219# Aeronautical Research Labs., Melbourne (Australia).
PERFORMANCE OF AUSTRALIAN CHROMIUM ALLOY TURBINE BLADES
A. S. Finlay Dec. 1973 42 p refs
(ARL-ME-Rept-141) Avail: NTIS HC $5.25

Chromium alloys for turbine use were produced; two of the alloys, Alloy E and Alloy J were used to make turbine blades which were subjected to a wide range of tests under simulated gas turbine conditions. It was shown that: (1) manufacture of turbine blades and vanes is readily achieved; (2) nitrogen penetration is confined to a surface layer, generally not more than about 0.1 mm deep, although deeper penetration may occur in local areas; (3) the metal loss rate of uncoated blades is about 0.11mg/sq cm/h4 at metal temperatures of 1000 C to 1040 C; (4) alloy J vanes are superior to Nimonic 115 vanes in thermal fatigue tests at temperatures alternating between 1100 C and 30 C; and (5) alloy E blades performed very satisfactorily in a turbine during a test program which included 100 hours at 1200 C plus 48 hours at 1260 C inlet gas temperatures. Author

N74-33220*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CASCADE PLUG NOZZLE Patent Application
Blake W. Corson, Jr., inventor (to NASA) Filed 12 Jul. 1974 23 p
(NASA-Case-LAR-11674-1; US-Patent-Appl-SN-488616) Avail: NTIS HC $4.25 CSCL 21E

An exhaust nozzle for jet aircraft is reported which provides suppression of jet noise with a minimum loss of thrust. The segmented nozzle contains a plurality of jet exits which break up the sound waves. NASA

N74-33221*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN AND PERFORMANCE OF A HIGH-PRESSURE-RATIO, HIGHLY LOADED AXIAL-FLOW TRANSONIC COMPRESSOR SPACE
George W. Lewis, Jr., Lonnie Reid, and Edward R. Tysl Washington Sep. 1974 93 p
(NASA-TM-X-3100; E-7377) Avail: NTIS HC $4.00 CSCL 21E

A 50-cm-diam. axial-flow transonic compressor stage with multiple-circular-arc blades was designed and tested. At design speed, a rotor peak efficiency of 0.85 occurred at an equivalent weight flow of 29.3 kg/sec. Stage peak efficiency was 0.79 at 28.6 kg/sec. Stage total pressure ratio at peak efficiency was 1.84. The stall margin at design speed was 5 percent. Rotor and stator losses were higher than predicted. The stator choked at design flow. Author

N74-33222*# Martin Marietta Corp., Denver, Colo. Planetary Systems Mission Analysis and Operations Sec.
MISSION ANALYSIS PROGRAM FOR SOLAR ELECTRIC PROPULSION (MAPSEP). VOLUME 1: ANALYTICAL MANUAL
P. E. Hong, G. L. Shults, R. J. Boain, K. R. Huling, and T. Wilson Mar. 1974 136 p refs
(Contract NAS8-29666)
(NASA-CR-120406; MCR-74-82-Vol-1) Avail: NTIS HC $10.00 CSCL 21C

The development of a computer program for the mission analysis of solar electric propulsion (MAPSEP) is discussed. The computer program contains the basic modes: TOPSEP (trajectory generation), GODSEP (linear error analysis), and SIMSEP (simulation). These modes and their various options give the user sufficient flexibility to analyze any low thrust mission with respect to trajectory performance, guidance and navigation, and to provide meaningful system related requirements for the purpose of vehicle design. Author

N74-33223*# Martin Marietta Corp., Denver, Colo. Planetary Systems Mission Analysis and Operations Sections.
MISSION ANALYSIS PROGRAM FOR SOLAR ELECTRIC PROPULSION (MAPSEP). VOLUME 2: USER'S MANUAL
G. L. Shults, R. J. Boain, K. R. Huling, T. Wilson, and P. E. Hong Mar. 1974 185 p refs
(Contract NAS8-29666)
(NASA-CR-120407; MCR-74-82-Vol-2) Avail: NTIS HC $12.25 CSCL 21C
For abstract, see N74-33222.

N74-33224*# Martin Marietta Corp., Denver, Colo. Planetary Systems Mission Analysis and Operations Section.
MISSION ANALYSIS PROGRAM FOR SOLAR ELECTRIC PROPULSION (MAPSEP). VOLUME 3: PROGRAM MANUAL
K. R. Huling, R. J. Boain, T. Wilson, P. E. Hong, and G. L. Shults Mar. 1974 564 p refs
(Contract NAS8-29666)
(NASA-CR-120408; MCR-74-82-Vol-3) Avail: NTIS HC $31.25 CSCL 21C
For abstract, see N74-33222.

N74-33225# National Aviation Facilities Experimental Center, Atlantic City, N.J.
THE FEASIBILITY OF DETECTING A BURNER-CAN BURN-THROUGH BY MEANS OF CO, CO2, PRESSURE, AND AIR TEMPERATURE LEVELS IN A JET ENGINE

NACELLE Final Report, Jan. 1972 - Jul. 1973
Richard Hill Mar. 1974 27 p
(FAA Proj. 181-522-010)
(AD-775304; FAA-RD-74-18; FAA-NA-73-110) Avail: NTIS HC $3.25

Full-scale tests simulating engine combustion section thermal failure (burn-through) were conducted using a cowled J-57 engine to determine the feasibility of detecting a burn-through by monitoring the carbon monoxide (CO), carbon dioxide (CO2), a pressure level, or air temperature in the nacelle before, during, and after engine case rupture. Results of the tests indicated that CO, CO2, pressure, and air temperature in the nacelle cannot be relied upon for early detection of a burn-through. Test results also indicated that containment of a burn-through flame in the nacelle creates extremely high temperatures in the nacelle and can cause extensive structural damage. Author

N74-33226*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
QUIET ENGINE PROGRAM FLIGHT ENGINE DESIGN STUDY
J. F. Klapproth, R. E. Neitzel, and C. T. Seeley Jul. 1974 123 p refs
(Contract NAS3-12430)
(NASA-CR-134660; R74AEG327) Avail: NTIS HC $9.25 CSCL 21E

The results are presented of a preliminary flight engine design study based on the Quiet Engine Program high-bypass, low-noise turbofan engines. Engine configurations, weight, noise characteristics, and performance over a range of flight conditions typical of a subsonic transport aircraft were considered. High and low tip speed engines in various acoustically treated nacelle configurations were included. Author

N74-33227*# Hughes Research Labs., Malibu, Calif.
EIGHT cm TECHNOLOGY THRUSTER DEVELOPMENT Final Report
Julius Hyman, Jr. Jul. 1974 93 p refs
(Contract NAS3-17791)
(NASA-CR-134685) Avail: NTIS HC $7.75 CSCL 21C

A structural integrated ion thruster with 8-cm beam diameter (SIT-8) was developed for attitude control and stationkeeping of synchronous satellites. As optimized, the system demonstrates a thrust T = 1.14 mlb (not corrected for beam V sub B = 1200 V (I sub sp = 2200 sec) total propellant utilization efficiency nu sub u = 59.8% (is approximately 72% without auxiliary pulse-igniter electrode), and electrical efficiency n sub E 61.9%. The thruster incorporates a wire-mesh anode and tantalum cover surfaces to control discharge chamber flake formation and employs an auxiliary pulse-igniter electrode for hollow-cathode ignition. When the SIT-8 is integrated with the compatible SIT-5 propellant tankage, the system envelope is 35 cm long by 13 cm flange bolt circle with a mass of 9.8 kg including 6.8 kg of mercury propellant. Two thrust vectoring systems which generate beam deflections in two orthogonal directions were also developed under the program and tested with the 8-cm thruster. One system vectors the beam over + or - 10 degrees by gimbaling of the entire thruster (not including tankage), while the other system vectors the beam over + or - 7 degrees by translating the accel electrode relative to the screen electrode. Author

N74-33228*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRETTING IN AIRCRAFT TURBINE ENGINES
Robert L. Johnson and Robert C. Bill [1974] 17 p refs Presented at the Specialists Meeting on Friction and Wear in Aircraft Systems, Munich, 11-12 Oct. 1974; sponsored by AGARD
(NASA-TM-X-71606; E-8090) Avail: NTIS HC $3.00 CSCL 21E

The problem of fretting in aircraft turbine engines is discussed. Critical fretting can occur on fan, compressor, and turbine blade mountings, as well as on splines, rolling element bearing races, and secondary sealing elements of face type seals. Structural fatigue failures have been shown to occur at fretted areas on component parts. Methods used by designers to reduce the effects of fretting are given. Author

N74-33229*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SEALING TECHNOLOGY FOR AIRCRAFT GAS TURBINE ENGINES
L. P. Ludwig and R. L. Johnson 1974 15 p refs Presented at the 10th Propulsion Conf., San Diego, Calif., 21-24 Oct. 1974; sponsored by AIAA and SAE
(NASA-TM-X-71607; E-8096) Avail: NTIS HC $3.00 CSCL 21E

Experimental evaluation under simulated engine conditions revealed that conventional mainshaft seals have disadvantages of high gas leakage rates and wear. An advanced seal concept, the self-acting face seal, has a much lower gas leakage rate and greater pressure and speed capability. In endurance tests (150 hr) to 43 200 rpm the self-acting seal wear was not measurable, indicating noncontact sealing operation was maintained even at this high rotative speed. A review of published data revealed that the leakage through gas path seals has a significant effect on TSFC, stall margin and engine maintenance. Reducing leakages by reducing seal clearances results in rubbing contact, and then the seal thermal response and wear determines the final seal clearances. The control of clearances requires a material with the proper combination of rub tolerance (abradability) and erosion resistance. Increased rub tolerance is usually gained at the expense of reduced erosion resistance and vice versa. Author

N74-33230*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OVERALL AND BLADE-ELEMENT PERFORMANCE OF A 1.20-PRESSURE-RATIO FAN STAGE AT DESIGN BLADE SETTING ANGLE
George W. Lewis, Jr. and Edward R. Tysl Washington Sep. 1974 97 p refs
(NASA-TM-X-3101; E-7791) Avail: NTIS HC $4.00 CSCL 21E

A 51-cm-diam. model of a short-haul fan stage was tested. Surveys of the air flow conditions ahead of the rotor, between the rotor and stator, and behind the stator were made over the stable operating range of the stage. At the design speed of 213.3 m/sec and weight flow of 26.7 kg/sec, the stage pressure ratio and efficiency are 1.18 and 0.87, respectively. The rotor peak efficiency of 0.92 occurred at flow rate of 30.5 kg/sec. Peak stage efficiency of 0.09 was obtained at 110 percent speed at a pressure ratio of 1.218 and a weight flow of 30.2 kg/sec. Maximum stage pressure ratio is 1.269 at 120 percent speed. Author

N74-33231*# Rocketdyne, Canoga Park, Calif.
TASK 12 DATA DUMP (PHASE 2) OME INTEGRATED THRUST CHAMBER TEST REPORT
R. D. Tobin and R. P. Pauckert 9 Aug. 1974 274 p
(Contract NAS9-12802)
(NASA-CR-140250; ASR74-229) Avail: NTIS HC $16.75 CSCL 21I

The characteristics and performance of the orbit maneuvering engine for the space shuttle are discussed. Emphasis is placed on the regeneratively cooled thrust chamber of the engine. Tests were conducted to determine engine operating parameters during the start, shutdown, and restart. Characteristics of the integrated thrust chamber and the performance and thermal conditions for blowdown operation without supplementary boundary layer cooling were investigated. The results of the test program are presented. Author

N74-33232# Royal Aircraft Establishment, Farnborough (England).
THE DEVELOPMENT OF AN ION PROPULSION SYSTEM AT SEP
C. Marion and J. Nuyts May 1974 18 p Transl. into ENGLISH from Development a la sep d'un systeme de propulsion ionique Presented at LAAS Conf. on Electric Propulsion in its Space Appl., Toulouse, 1972
(RAE-Lib-Trans-1770; BR42131) Avail: NTIS HC $4.00

The use of ion thrusters for attitude control and stationkeeping of communication satellites is discussed. The advantages of ion propulsion over other systems, when mass, as well as reliability and mission life are involved, are analyzed. The development of

a cesium bombardment type engine and the required test facilities are reported. Author

N74-33233# Royal Aircraft Establishment, Farnborough (England).
ION PROPULSION RESEARCH IN FRANCE
M. J. Mutin (CNES) May 1974 10 p refs Transl. into ENGLISH from Les Recherches en France sur la Propulsion Ionique Presented at LAAS Journees d'Etudes, Toulouse, 1972
(RAE-Lib-Trans-1769; BR42100) Avail: NTIS HC $4.00

The development and characteristics of ion engines and plasma accelerators are discussed. Specific research programs for improving the performance of ion engines are described. The operating parameters of electromagnetic thrusters and electrothermal thrusters are analyzed. Author

N74-33234# Politecnico di Torino (Italy). Ist. di Macchine e Motori per Aeromobili.
PERFORMANCE OF A CLOSED CYCLE GAS TURBINE UTILIZING VARIOUS WORKING FLUIDS FOR USE IN SPACE [PRESTAZIONI DI UNA TURBINA A GAS A CICLO CHIUSO PER IMPIEGO SPAZIALE FUNZIONANTE CON DIVERSI FLUIDI DI LAVORO]
Paolo Campanaro and Nicola Nervegna Mar. 1974 50 p refs In ITALIAN; ENGLISH summary
(Publ-159) Avail: NTIS HC $5.50

For a Brayton dynamic system to deliver electric power on board orbiting satellites, several monoatomic working gases (both pure and as binary mixtures) were investigated. The aim was to select, for different needs of power level and degree of pressurization, the working fluid which would yield better performances in regard to efficiency and weight. A FORTRAN was written to accomplish the analysis; as such it is capable of simulating on a digital computer, the performance of the power system with given turbomachinery and heat exchangers hardware. It was run leaving as working parameter the type of fluid used, in relation to molecular weight and transport characteristics as viscosity and thermal conductivity. The study leads to an optimization of the power cycle for given design conditions.
Author (ESRO)

N74-33235# National Aerospace Lab., Amsterdam (Netherlands).
ESTIMATION OF THE SHIELDING EFFECT OF THE WING ON AIRCRAFT ENGINE NOISE, USING THE KIRCHHOFF-APPROXIMATION
J. J. Tiggelaar 29 Mar. 1973 42 p refs Sponsored by the Neth. Agency for Aerospace Programs
(NLR-TR-73033-U) Avail: NTIS HC $5.25

For a simplified airplane model in a uniform flow, an estimation of the shielding effect of the wing for a single frequency point source of sound was made. The sound field was calculated using a Kirchhoff type approximation for the boundary values of the field. Some indications concerning the validity of this approximation are mentioned. Results are presented for a monopole and a dipole source; they show a pronounced shielding effect, which is most important for the monopole. Author (ESRO)

N74-33236# European Space Research Organization, Paris (France).
NOMOGRAPHS FOR GEOSTATIONARY ORBITAL TRANSFER BY SOLAR-ELECTRIC PROPULSION
Konrad Rudolf Schreitmueller Jun. 1974 41 p refs Transl. into ENGLISH of Bahnuebergaenge auf die Geostationaere Bahn mit Hilfe Solar-elek. Antriebssysteme, DLR-FB-73-94, DFVLR, 2 Aug. 1973
(ESRO-TT-71; DLR-FB-73-94) Avail: NTIS HC $5.25; DFVLR, Porz, West Ger. 17 DM

The transfer from a low to a geostationary orbit is discussed along with simplified calculation methods. Results are represented in nomographs. Thus, it is possible to immediately get the corresponding final values - mass, transfer time, and degradation factor - from each combination of the starting parameters or, vice versa, the starting parameters for a given combination of the final values. Author (ESRO)

N74-33237# United Technology Center, Sunnyvale, Calif.
HIGH CHAMBER PRESSURE BLAST TUBE AND NOZZLE MATERIAL EVALUATION. VOLUME 2: VALIDATION OF THERMOCHEMICAL ANALYSIS TECHNIQUES FOR HIGH CHAMBER PRESSURE SOLID ROCKET NOZZLES WITH HIGH VELOCITY BLAST TUBES Final Report
Wendell A. Stephen, T. E. Frakes, T. V. OHara, D. L. Baker, A. J. Murphy, and M. R. Wool 17 Jun. 1974 199 p refs Prepared for United Technology Center, Sunnyvale, Calif.
(Contract F04611-71-C-0051)
(AD-780532; UTC-2410-FR-Vol-2; AFRPL-TR-73-60-Vol-2) Avail: NTIS CSCL 21/8

The set of Aerotherm computer programs (ACE, CMA, ARGEIBL) which were validated for charring ablating and carbon/carbon materials in conventional and low velocity blast tube nozzles were validated for these same materials for high velocity blast tube nozzles, operation at high chamber pressures (up to 3000 psia), and aluminized CTPB propellants which vary in aluminum content from 5 to 18 percent. The validation was determined based on comparisons between measured and predicted surface recession and char depth thickness and between predicted and determined convective heat transfer coefficients. In general, the agreement between the analytical predictions and the surface recession and char depth data was within the experimental accuracy of the measurements with the exception of the throat. The best agreement was obtained for the analysis locations in the blast tube and exit cone. The poorest agreement occured for the pyrolytic graphite washers in the nozzle throat region. (Modified author abstract) GRA

N74-33238# AiResearch Mfg. Co., Phoenix, Ariz.
SMALL TURBINE ENGINE NOISE REDUCTION. VOLUME 1: EXECUTIVE SUMMARY Final Report, 7 May 1971 - 31 May 1973
R. W. Heldenbrand and R. N. Tedrick Dec. 1973 92 p refs
(Contract F33615-71-C-1457; AF Proj. 306614)
(AD-780533; AiResearch-73-210285-1-Vol-1; AFAPL-TR-73-79-Vol-1) Avail: NTIS CSCL 21/5

The volume summarizes the technical objectives and desired end products. It also summarizes the results of the three test phases of the program and contains a brief discussion of contract documentation requirements and conclusions regarding the overall program results. Author (GRA)

N74-33239# AiResearch Mfg. Co., Phoenix, Ariz.
SMALL TURBINE ENGINE NOISE REDUCTION. VOLUME 2: NOISE PREDICTION METHODS Final Report, 7 May 1971 - 31 May 1973
E. Grande, D. Brown, L. Sutherland, and Richard N. Tedrick Dec. 1973 377 p refs
(Contract F33615-71-C-1457; AF Proj. 3066)
(AD-780573; AiResearch-73-210285-2-Vol-2; AFAPL-TR-73-79-Vol-2) Avail: NTIS CSCL 21/5

The volume presents reviews of many currently available methods for predicting small gas turbine noise source characteristics involving those developed, adopted, or modified. A total engine noise prediction methodology using those component noise prediction techniques shown to be the most practical and reliable for small gas turbine engines is also presented.
Author (GRA)

N74-33240# AiResearch Mfg. Co., Phoenix, Ariz.
SMALL TURBINE ENGINE NOISE REDUCTION. VOLUME 3: SUPPRESSION DESIGN AND PREDICTION METHODOLOGY/MATERIALS TESTS Final Report, 7 May 1971 - 31 May 1973
W. M. Gipson and R. N. Tedrick Dec. 1973 149 p refs
(Contract F33615-71-C-1457; AF Proj. 3066)
(AD-780574; AiResearch-73-210285-3-Vol-3; AFAPL-TR-73-79-Vol-3) Avail: NTIS CSCL 21/5

The volume reviews the published theoretical background from a number of sources to present a uniform approach to duct and lining sound-attenuation prediction. It further reviews the results of a wide variety of acoustical tests of lining materials and configurations. The final development of an applicable technology for small gas turbine duct attenuator design and attenuation prediction is included, along with comparison to actual turbopropulsion duct test data. Author (GRA)

N74-33241# AiResearch Mfg. Co., Phoenix, Ariz.
SMALL TURBINE ENGINE NOISE REDUCTION.

VOLUME 4: TURBOPROP ENGINE DEMONSTRATION TESTS Final Report, 7 May 1971 - 31 May 1973
W. M. Gibson, R. W. Heldenbrand, and Richard N. Tedrick Dec. 1973 242 p refs
(Contract F33615-71-C-1457; AF Proj. 3066)
(AD-780575; AiResearch-73-210285-4-Vol-4; AFAPL-TR-73-79-Vol-4) Avail: NTIS CSCL 21/5

The volume describes the full-scale engine test program and presents selected data with results of the engine noise reduction development. Engine testing was accomplished to provide experimental verification of engine noise prediction and suppression techniques established in the preceding volumes.
Author (GRA)

N74-33242# AiResearch Mfg. Co., Phoenix, Ariz.
SMALL TURBINE ENGINE NOISE REDUCTION. VOLUME 6, PART 1: NOISE PREDICTION PROGRAM USER'S MANUAL Final Report, 7 May 1971 - 31 May 1973
W. M. Gipson, B. M. Goodman, and P. Y. Ho Dec. 1973 170 p refs
(Contract F33615-71-C-1457; AF Proj. 3066)
(AD-780577; AiResearch-73-210285-6-Vol-6; AFAPL-TR-73-79-Vol-6-Pt-1) Avail: NTIS CSCL 21/5

Vol. 6, Part I, calculates the bare-engine noise signature and typical flyover sound levels of small, installed, aircraft turbopropulsion engines. Techniques were employed or adapted to accurately predict the radiated acoustic signature (during either static test or aircraft flyover) of turboprop and turbofan propulsion systems in the 80- to 1000-shaft-horsepower class for turboprops and in the 400- to 5000-pound-thrust class for turbofans. In order to adequately predict the flyover noise signature of such an engine, it was first necessary to predict the contributions to that signature from each component. Garrett AiResearch and their subcontractor, Wyle Laboratories, Inc., cooperatively evaluated published prediction methods for each source, using measuring small-engine noise data. Author (GRA)

N74-33243# Army Aviation Systems Command, St. Louis, Mo.
MAJOR ITEM SPECIAL STUDY (MISS), OH-6A GAS TURBINE ENGINE (T63-A-5A) Interim Report, 1 Jan. 1964 - 1 Jul. 1973
Jun. 1974 21 p refs
(AD-781506; USAAVSCOM-TR-74-30) Avail: NTIS CSCL 21/5

Major Item Special Study (MISS) reports are performed on DA Form 2410 reportable components. These are time change items and certain condition change items selected because of high cost or need for intensive management. Basically, the MISS reports are concerned with analyzing reported removal data presented in the Major Item Removal Frequency (MIRF) report. The failure modes reported for each removal are examined and grouped into categories which are intended to clarify the intent of the data reporting. From these data, removal distribution can be plotted and an MTR (mean time to removal) can be calculated. The MISS reports then investigate possible cost savings based on total elimination of selected failure modes. These modes are chosen because of the percentage of failures they represent and/or because they appear to be feasible Product Improvement Program (PIP) areas. Author (GRA)

N74-33244# ARO, Inc., Arnold Air Force Station, Tenn.
EXHAUST PLUME TEMPERATURE EFFECTS ON NOZZLE AFTERBODY PERFORMANCE OVER THE TRANSONIC MACH NUMBER RANGE Final Report
C. E. Robinson and M. D. High AEDC Jul. 1974 92 p refs (AF Proj. 5975)
(AD-781377; ARO-PWT-TR-73-112; AEDC-TR-74-9) Avail: NTIS CSCL 21/5

Results of an experimental and analytical research investigation on nozzle/afterbody drag are presented. Experimental afterbody (and boattail) drag coefficients and pressure distributions are discussed for an isolated, strut-mounted nozzle/afterbody model for the Mach number range from 0.6 to 1.5. Some data are also given for free-stream unit Reynolds numbers from one million to approximately four million per foot. The experimental data were obtained for the basic model with an air-cooled and a water-cooled Ethylene/air combustor to provide hot-jet duplication as well as cold-jet simulation. The temperature of the nozzle exhaust gas was varied from 530R (burner-off) to approximately 2500R for several nozzle pressure ratios from jet-off to those corresponding to a moderately under-expanded exhaust plum. The initial series of experiments was conducted with the air-cooled combustors, and the effect of jet temperature on afterbody drag was somewhat masked by the effects of the secondary airflow from the cooling air. The general trend, however, shows a decreasing afterbody drag with increasing exhaust gas temperature and with decreasing secondary airflow at a fixed nozzle pressure ratio. (Modified author abstract) GRA

N74-33245# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
PRELIMINARY STUDY OF THE CATALYTIC COMBUSTOR CONCEPT AS APPLIED TO AIRCRAFT GAS TURBINES Final Report, Jan. 1972 - Feb. 1974
William S. Blazowski and Gerald E. Bresowar May 1974 65 p refs
(AF Proj. 3048)
(AD-781762; AFAPL-TR-74-32) Avail: NTIS CSCL 21/2

The investigation was intended to study the feasibility of using solid catalytic beds in the reaction zone of aircraft gas turbine combustors. Since the catalytic combustor operates at low-equivalence ratios throughout (there is no near-stoichiometric operation as in most conventional combustors), oxide of nitrogen emissions were forecast to be extremely low. JP-4 fuel was used throughout the experimental test program. Flashback and preignition were observed and the fuel introduction system developed to partially overcome these problems is described. At all operating conditions tested, NOx concentration was to be below 2 ppmV -- two orders of magnitude below that expected from a conventional combustor operated under similar inlet and exhaust conditions. No reduction in performance was noted over the 28 hours of test operation. (Modified author abstract) GRA

N74-33246# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MORE ABOUT LASER ENGINES
Mikhail Tutekov 28 May 1974 8 p refs Transl. into ENGLISH from Voenna Tekhnika (Bulgaria), no. 8, 1973 9 p
(AD-781674; FTD-HC-23-2059-74) Avail: NTIS CSCL 21/3

Laser engines of the plasma-forming fuel chamber type will probably become a reality in the near future. But the problems have not yet been solved of how to design suitable exhaust systems and mechanically suitable fuel chambers of workably small size. Nor has the question been answered as to what optimum natural energy sources can be used for space flight. Flights in space using laser rocket engines will be a great step toward the realization of man's dream about flying beyond the solar system. This dream will be realized after the creation of laser engines using light pressure as a motive force. GRA

N74-33247# Pratt and Whitney Aircraft, East Hartford, Conn.
DIRECTIONAL SOLIDIFICATION OF Ni3Cb REINFORCED EUTECTIC TURBINE BLADES Final Report, 16 Mar. 1973 - 15 Mar. 1974
Patrick M. Curran and John S. Erickson May 1974 124 p refs
(Contract N00019-73-C-0252)
(AD-781320; PWA-4954) Avail: NTIS CSCL 11/6

The purpose of this program was to investigate the solidification processing techniques required to produce directionally solidified eutectics in turbine blade form for airfoils. Three directional solidification investment castings processes, namely, the modified Bridgman, commercial withdrawal and liquid metal cooling techniques were evaluated for casting eutectic turbine blades. It was determined that the liquid metal cooling process offered the highest temperature gradient capability of the three processes evaluated and therefore primary emphasis was placed on evaluating this solidification technique. Fully lamellar microstructures achieved in gamma prime delta eutectic turbine blades made by the liquid metal cooling process exhibited creep rupture properties at 1800F equivalent to laboratory grown material, thereby establishing the viability of fabricating eutectic turbine blades by this method. A one dimensional heat transfer model

was successfully used to indicate directions for improving process temperature gradient. (Modified author abstract) GRA

N74-33248# Solar, San Diego, Calif.
CONTINUED DEVELOPMENT TWO STAGE HIGH PRESSURE RATIO CENTRIFUGAL COMPRESSOR Final Report
Colin Rodgers Apr. 1974 41 p
(Contract DAAJ02-73-C-0045; DA Proj. 1G1-62207-AA-71) (AD-781592; ER-2460; USAAMRDL-TR-74-20) Avail: NTIS CSCL 21/5

The report presents the results of a continued compressor technology program directed toward development of a small, advanced, two-stage centrifugal compressor designed to attain high pressure ratios with fixed geometry. Extensive compressor performance data were obtained for two test configurations. The second test configuration, incorporating a minor rematch to the first-stage compressor components, and operating at a design speed of 82,000 rpm, gave a peak adiabatic efficiency of 78% with a pressure ratio of 13.2 and a corrected airflow of 1.94 pps. The compressor exhibited extremely wide flow ranges between surge and choke, with peak efficiencies away from the surge line. Author (GRA)

N74-33249# Naval Air Propulsion Test Center, Trenton, N.J. Propulsion Technology and Project Engineering Dept.
STATE-OF-THE-ART REVIEW: SMALL GAS TURBINE ENGINE TECHNOLOGY
Robert B. Benham Jun. 1974 199 p refs
(AD-781651; NAPTC-PE-35) Avail: NTIS

The report looks at the spectrum of Navy missions and determines the major applicable performance or cost parameters. The competitiveness in each parameter is examined for three types of small engines -- the reciprocating (both Otto and Diesel cycles), the rotary-combustion and the gas turbine. A discussion on the impact of military programs - ATEGG, STEP, STAGG, SCAD, HARPOON, ETE, and RPV - on the small turbine engine evolutionary cycle is provided. It is found that evolution will proceed along each of two separate lines (1) maximum performance and (2) minimum specific cost. It is determined that the gas turbine engine suffers from size effects which render the 5 lb/sec air-flow engine inferior in every parameter to the 30 lb/sec engine. The effects of scaling on the performance of the major components - compressor, turbine, combustor, bearings, seals, and controls, is examined. Techniques for cost reduction are considered. Programs for upgrading component performance and lowering fabrication costs are proposed. Author (GRA)

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

N74-33250*# American Science and Engineering, Inc., Cambridge, Mass.
CONTINUING DATA ANALYSIS OF THE AS/E GRAZING INCIDENCE X-RAY TELESCOPE EXPERIMENT ON THE OSO-4 SATELLITE Final Report, 14 Jan. 1972 - 31 Oct. 1973
G. Vaiana, R. Haggerty, S. Kahler, A. Krieger, M. Landini, A. Timothy, and D. Webb 31 Oct. 1973 171 p refs
(ASE-3394; Contract NASw-2346)
(NASA-CR-139685) Avail: NTIS HC $11.75 CSCL 03B

The work to correct and extend the calculation of the theoretical solar X-ray spectrum produced during earlier OSO-4 data analysis is reported along with the work to formulate models of active regions, and compare these models with the experimental values. An atlas of solar X-ray photographs is included, and solar X-ray observations are correlated with the solar wind. F.O.S.

N74-33251# Joint Publications Research Service, Arlington, Va.
OBSERVATIONS OF THE SUN OUTSIDE THE ATMOSPHERE
V. A. Krat 8 Aug. 1974 16 p refs Transl. into ENGLISH from Priroda (Moscow), no. 5, 1974 p 35-41
(JPRS-62677) Avail: NTIS HC $4.00

Observations of the sun are reported using solar stratospheric observatories. It is shown that the observatory can land to check adjustments on electronic equipment and optics, and again be raised into the stratosphere. M.C.F.

N74-33252*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR He-3: INFORMATION FROM NUCLEAR REACTIONS IN FLARES
R. Ramaty and B. Kozlovsky Aug. 1974 32 p refs Presented at Seminar on Particle Acceleration and Nucl. Reactions in Space, Leningrad, 19-21 Aug. 1974
(NASA-TM-X-70750; X-660-74-255) Avail: NTIS HC $4.75 CSCL 03B

Information on solar He-3 from nuclear reactions in flares was considered. Consideration was also given to the development of models for these reactions as well as the abundance of He-3 in the photosphere. Data show that abundances may be explained by nuclear reactions of flare acceleration protons and alpha particles with the ambient atmosphere, provided that various assumptions are made on the directionality of the interacting beams and acceleration of the particles after production. Author

N74-33253# Manila Observatory (Philippines).
SOLAR MAPS AND ACTIVITIES, AUGUST 1974
Francis J. Heyden, comp., Angelito G. Ambion, comp., and Enrique R. Gallardo, comp. Aug. 1974 5 p refs
Avail: NTIS HC $4.00

Photographs of solar activity during August 1974 are presented. The parameters governing the photographs are as follows: (1) calcium photographs are timed to the nearest minute, (2) sunspot numbers are obtained from white light photographs, (3) prominences are sketched on the periphery of the calcium images and represent the accumulated observations from sunrise to sunset, and (4) flare data compiled from the visual patrol from sunrise to sunset. Author

N74-33254*# California Univ., Berkeley. Space Sciences Lab.
A STUDY OF X-RAY EMISSION FROM GALACTIC AND EXTRAGALACTIC SOURCES WITH EMPHASIS ON SOFT AND ULTRA-SOFT WAVELENGTHS Annual Report, 1 Jun. 1973 - 31 May 1974
C. S. Bowyer, Michael Lampton, R. G. Cruddace, and Francesco Paresce Aug. 1974 16 p refs
(Grant NGR-05-003-450)
(NASA-CR-139686; SSL-Ser-15-Issue-43) Avail: NTIS HC $4.00 CSCL 03B

A Black Brant VC rocket was used to scan the Coma and Virgo clusters in order to measure structure in the X-ray sources. The rocket also made measurements of soft X-ray spectra, soft X-ray background flux during a 50 deg scan of the sky, soft X-rays from De Voucoulers 50, set limits to the energy dependence of soft X-ray background spectra, and the flux of solar 584 A radiation resonantly scattered by interstellar He flowing through the solar system. Author

N74-33255# California Univ., Berkeley. Lawrence Berkeley Lab.
MEASUREMENTS OF COSMIC RADIATION DOSE IN SUBSONIC COMMERCIAL AIRCRAFT COMPARED TO THE CITY-PAIR DOSE CALCULATION
R. Wallace 16 Jul. 1973 74 p refs
(Contract W-7405-eng-48)
(LBL-1505) Avail: NTIS HC $5.45

The radiation dose received by passengers during flight on conventional jet aircraft was determined as a function of exposure to cosmic radiation, solar radiation, flight time, and flight path. The dosimetric measurements were made with thermoluminescent dosimeters (TLD's) and with emulsions of three types sealed in plastic packets. It was concluded that the total doses received at present day conventional jet aircraft altitudes are considerably higher than those encountered in supersonic flights at much higher altitudes, even though the dose rate is lower at

these lower altitudes, when the longer time of exposure at the lower altitudes is taken into consideration. NSA

N74-33256# Los Alamos Scientific Lab., N.Mex.
DEVELOPMENT OF THE OSO-6 HIGH-ENERGY NEUTRON DETECTOR AND CORRELATION OF MEASURED SOLAR NEUTRON FLUXES TO SOLAR FLARES Ph.D. Thesis - N. Mex. Univ.
F. Young Feb. 1974 173 p refs
(Contract W-7405-eng-36)
(LA-5487-T) Avail: NTIS HC $7.60

The development of a directional high energy neutron detector which was flown to satellite altitudes in the orbiting solar observatory is described. Both the angle of incidence and the energy of the neutron are determined by a proton recoil telescope which provides the source for proton recoils and defines the dE/dX versus E method for particle identification and energy determination. Results from a Monte Carlo calculation indicate that the overall average efficiency within an average angular acceptance of about 29 deg is approximately (2.25 + or - 0.113) x 0.0001. The inflight calibration procedure, the main frame data bit error analysis, and the method for determining the orientation of the detector axis in the spacecraft spin plane are described. Results indicate a discrepancy in the measured and theoretical neutron fluxes which suggests high energy neutron production at the sun. Author (NSA)

N74-33257# California Univ., Berkeley. Lawrence Berkeley Lab.
FAR INFRARED SPECTROMETRY OF THE COSMIC BACKGROUND RADIATION Ph.D. Thesis
J. C. Mather Jan. 1974 211 p refs
(Contract W-7405-eng-48)
(LBL-2258) Avail: NTIS HC $13.75 CSCL 03B

Two experiments to measure the cosmic background radiation near 1 mm wavelength are described. The first was a ground-based search for spectral lines, made with a Fabry-Perot interferometer and an InSb detector. The second is a measurement of the spectrum from 3 to 18 cm-1, made with a balloon-borne Fourier transform spectrometer. It is a polarizing Michelson interferometer, cooled in liquid helium, and operated with a germanium bolometer. The theory of operation, construction details, and experimental results are given. The first experiment was successfully completed but the second suffered equipment malfunction on its first flight. The theory of Fourier transformations is described and a new understanding of convolutional phase correction computations is given. Far infrared bolometer calibration procedures are discussed and test results on nine detectors are tabulated. Methods of improving bolometer sensitivity with immersion optics and with conductive film blackening are described. Author (NSA)

N74-33258# Lincoln Lab., Mass. Inst. of Tech., Lexington.
VISUAL MAGNITUDE FLUX RATE DENSITY STANDARDS FOR SUNLIGHT INCIDENT ON PHOTOEMISSIVE SURFACES
Robert Weber 6 May 1974 25 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-779822; TN-1974-20; ESD-TR-74-171) Avail: NTIS CSCL 09/1

Based on the spectrum of the real sun, a zero visual magnitude photon flux rate density of 5.00 x 10 to the 10th power p/sq. m-sec is calculated for a bandwidth of 0.300 micrometer to 0.920 micrometer, a range corresponding to the useful responsivity-bandwidths of both S-20 and S-25 photosurfaces. Over this bandwidth, the average quantum efficiencies of the photosurfaces are shown to agree to within 0.1 percent at a value of 7.2 percent. Finally, photon and photoelectron flux rate densities are calculated for sources of varying visual magnitudes and for transmission through one to five standard air masses. Author (GRA)

N74-33259# Chicago Univ., Ill. Lab. for Astrophysics and Space Research.
DETAILED SPECTRAL INVESTIGATIONS OF THE X-RAY EMISSIONS FROM THE SUN Final Report
Richard L. Blake Jul. 1973 10 p refs
(Contract F44620-70-C-0123; AF Proj. 9751)
(AD-765133; AFOSR-73-1364TR) Avail: NTIS CSCL 03/2

The goal of this research program has been to gain increased knowledge of the physical processes in the solar atmosphere. In addition to the rocket experiments, several projects in the laboratory that relate to the general problem of detection and interpretation of X-rays are summarized. These include measurements of (1) the spectrometric properties of crystals, (2) techniques to produce very finely collimated beams of X-rays, (3) proportional counter detector parameters at sub-atmospheric pressures, (4) interaction coefficients of X-rays with matter, and (5) techniques for X-ray photography. Modified author abstract (GRA)

N74-33341 Observatoire de Paris-Meudon (France). Section d'Astrophysique.
PHYSICAL MECHANISMS OF INFRARED RADIATIVE PROCESSES
P. Lena *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 24 p refs (For availability see N74-33330 22-31)

N74-33063 Israel Program for Scientific Translations, Ltd., Jerusalem.
ARGON SPALLATION YIELDS OF COSMOGONIC RADIOISOTOPES
R. Yu. Yasyulenis, V. Yu. Luyanas, and B. I. Styro *In its* Nucl. Meteorol. (TT-74-50011) 1974 p 197-200 refs Transl. into ENGLISH from the Proc. of the All-Union Conf. on Nucl. Meteorol. (Obninsk), Proc. no. 21, 25, 23-28 Jun. 1969 (For availability see N74-33035 22-20)
CSCL 18H

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N74-33260*# Aerospace Corp., El Segundo, Calif. Guidance and Control Div.
OPERATIONS ANALYSIS (STUDY 2.1). PROGRAM SEPSIM (SOLAR ELECTRIC PROPULSION STAGE SIMULATION)
T. J. Lang 28 Jun. 1974 38 p ref
(Contract NASw-2575)
(NASA-CR-140027; ATR-74(7341)-2) Avail: NTIS HC $5.00 CSCL 22A

Program SEPSIM is a FORTRAN program which performs deployment, servicing, and retrieval missions to synchronous equatorial orbit using a space tug with a continuous low thrust upper stage known as a solar electric propulsion stage (SEPS). The SEPS ferries payloads back and forth between an intermediate orbit and synchronous orbit, and performs the necessary servicing maneuvers in synchronous orbit. The tug carries payloads between the orbiter and the intermediate orbit, deploys fully fueled SEPS vehicles, and retrieves exhausted SEPS vehicles when, and if, required. The program is presently contained in subroutine form in the Logistical On-orbit VEhicle Servicing (LOVES) Program, but can also be run independently with the addition of a simple driver program. Author

N74-33261*# Aerospace Corp., El Segundo, Calif. Advanced Orbital Systems Div.
OPERATIONS ANALYSIS (STUDY 2.1). CONTINGENCY ANALYSIS
15 Jul. 1974 65 p refs
(Contract NASw-2575)
(NASA-CR-140028; ATR-74(7341)-5) Avail: NTIS HC $6.25 CSCL 22A

Future operational concepts for the space transportation system were studied in terms of space shuttle upper stage failure contingencies possible during deployment, retrieval, or space servicing of automated satellite programs. Problems anticipated during mission planning were isolated using a modified 'fault tree' technique, normally used in safety analyses. A comprehensive space servicing hazard analysis is presented which classifies

possible failure modes under the catagories of catastrophic collision, failure to rendezvous and dock, servicing failure, and failure to undock. The failure contingencies defined are to be taken into account during design of the upper stage. A.A.D.

N74-33262# Joint Publications Research Service, Arlington, Va.
PHYSICS OF SPACEFLIGHT
S. N. Palkin 12 Sep. 1974 38 p refs Transl. into ENGLISH of the book "Fizika Kosmicheskikh Poletov" Leningrad, Izdatelstvo Znaniye, RSFSR, 21 Nov. 1973 p 1-30
(JPRS-62947) Avail: NTIS HC $5.00

A discussion of the physical processes and phenomena transpiring during the flight of satellites and spaceships is reported. Author

N74-33263*# Martin Marietta Corp., Denver, Colo.
STUDY OF BALLISTIC MODE COMET ENCKE MISSION OPPORTUNITIES Final Report
G. R. Hollenbeck and J. M. VanPelt Aug. 1974 103 p
(Contract NAS2-7564)
(NASA-CR-137524; MCR-74-210) Avail: NTIS HC $8.25 CSCL 22A

An analysis was conducted of the space mission to intercept the comet Encke. The two basic types of flight geometry considered for the mission are described. The primary interactions between time-of-flight and performance characteristics are displayed. The representative spacecraft characteristics for the Titan 3/Centaur launch vehicle are tabulated. The navigation analyses for the two missions are developed to show: (1) assessment of the navigation feasibility of the missions, (2) determination of the total velocity budget for the trim maneuvers, and (3) evaluation of dispersions at comet encounter. Author

N74-33264*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PIONEER VENUS: REPORT OF A STUDY BY THE SCIENCE STEERING GROUP, JUNE 1972
Aug. 1974 77 p refs
(NASA-TM-X-62379) Avail: NTIS HC $4.00 CSCL 22A

The 1976/77 multiple probe mission of the Pioneer Venus spacecraft is discussed, along with the 1978 and 1980 missions. Various questions about Venus are answered; velocities and temperatures expected in the atmosphere, atmospheric chemistry, magnetic measurements, and model atmospheres are included. J.A.M.

N74-33265*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
APOLLO PARTICLES AND FIELDS SUBSATELLITE MAGNETOMETER EXPERIMENT Final Report
P. J. Coleman, Christopher T. Russell, and Gerald Schubert Jul. 1974 26 p refs
(Contract NAS9-12236)
(NASA-CR-140213; IGPP-1372-55) Avail: NTIS HC $4.50 CSCL 22C

The results of the Apollo 15 subsatellite magnetometer experiment are reported. The magnetometer is described including the operation, and specifications. Orbit plots presented are altitude versus time, selenographic longitude versus latitude, and the ecliptic projection of the earth-moon system. The lunar magnetic field, solar wind interaction with the moon, the transfer function of the moon, and the plasma sheet interaction with the moon are discussed. F.O.S.

N74-33266# Observatorium Bosscha, Bandung (Indonesia).
EVOLUTION OF STARS TOWARD THE MAIN SEQUENCE
B. Hidajat Oct. 1973 12 p refs
(Rept-8) Avail: NTIS HC $4.00

A review is presented on the knowledge of stellar evolution toward the main sequence. This is the period during which the stars evolve from the beginning of their formation to the phase of stabilization on the main sequence where nuclear reactions begin to provide the entire energy supply. Author

N74-33267# Observatorium Bosscha, Bandung (Indonesia).
THE dB AND gK STARS NEAR THE DIRECTION OF THE GALACTIC CENTER
B. Hidajat and I. Radiman Jun. 1973 11 p refs Repr. from Proc. ITB, v. 7, no. 2, 1973 p 77-86
(Rept-46) Avail: NTIS HC $4.00

An objective prism survey of the Palomar-Groningen variable stars field no. 3 has been undertaken in order to determine the stellar space distribution of dB and gK stars. A concentration of dB stars has been found at the distances between 150 to 250 pcs. The color excess in this direction is found to remain very low. It only reaches OT12 at r = 0.5 kpc and remains constant thereafter. Author

N74-33268# Observatorium Bosscha, Bandung (Indonesia).
CATALOGUE OF dB AND gK STARS IN THE PALOMAR-GRONINGEN VARIABLE-STAR FIELD NO. 3
I. Radiman and B. Hidajat 1973 18 p refs
Avail: NTIS HC $4.00

Magnitudes and Colors for 662 stars belonging to the spectral groups of B8 - A2 and gG8-gK2 are presented. These stars are shown on the Finding Chart 3a-3d. Author

N74-33269*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
NEAR-INFRARED SPECTRA OF JUPITER, SATURN, AND URANUS
Andrew E. Potter 1974 252 p refs
(NASA-SP-3086; JSC-S-397) Avail: NTIS HC $6.50 CSCL 03B

Near infrared spectra of Jupiter, Saturn, and Uranus were measured at resolutions higher than previously available in the range from 6,000 to 10,750/cm. The resolution was 0.5/cm for Jupiter and Saturn, and 32/cm for Uranus. The spectra are presented both individually and as ratio spectra, in which the planetary spectra are divided by the solar spectrum. The Uranus spectrum is shown with Saturn, Jupiter, and Sun spectra reduced to the same resolution so that Uranus can be compared with the other outer planets. The high resolution Saturn, Jupiter, and Sun spectra are presented in parallel plots to simplify comparisons between them. Author

N74-33270# Technische Univ., Berlin (West Germany).
INSTITUTE FOR SPACE FLIGHT TECHNOLOGY, 10 YEARS, 1963 - 1972, EXPERIENCES AND ACCOUNTING REPORT [INSTITUT FUER RAUMFAHRTTECHNIK, ERFAHRUNGS UND RECHENSCHAFTS BERICHT]
H. H. Koelle Dec. 1972 77 p refs In GERMAN
(TUB-IR-1972/3) Avail: NTIS HC $7.00

After a general review of the institute's activities, lists of lecture programs and the various research projects are reported. Transl. by G.G.

N74-33271# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 332
12 Sep. 1974 67 p refs Transl. into ENGLISH from various Russian articles
(JPRS-62943) Avail: NTIS HC $6.50

Translations and abstracts of articles on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics, covering both science news and formal scientific reports are given. Published details of Soviet space spectaculars are included. Author

N74-33272*# Texas Univ., Austin.
STUDY OF OPTICAL PROPERTIES OF X-RAY SOURCES Semiannual Report, 1 Jan. - 31 Aug. 1974
Paul A. VandenBout 31 Aug. 1974 5 p ref
(Grant NGR-44-012-209)
(NASA-CR-140017) Avail: NTIS HC $4.00 CSCL 03A

X-ray sources are reported for HZ Herculis, supergiant primary X-ray binary systems, and Cyg X-3. Also reported is an analysis of earlier optical and X-ray observations, along with optical coverage of the 1974 lunar occulation of the Crab Nebula. M.C.F.

N74-33273*# Linguistic Systems, Inc., Cambridge, Mass.
CIRCULATION AND DUST CONTENT OF THE VENUS ATMOSPHERE FROM WIND VELOCITY MEASUREMENTS

BY THE VENERA-8 AUTOMATIC INTERPLANETARY PROBE

V. V. Kerzhenovich and M. Ya. Marov Washington NASA Sep. 1974 11 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 215, no. 3, Mar. 1974 p 554-557
(Contract NASw-2482)
(NASA-TT-F-15679) Avail: NTIS HC $4.00 CSCL 03B

Measurement data of the horizontal component of the wind velocity on Venus during descent of the Venera 8 planetary probe are presented. The azimuth of the wind direction, counted off clockwise from the North pole direction, is approximately 115 deg, i.e., the measured component was close to the zonal (latitudinal) one. The wind velocity comprised from 0.5 m/sec near the surface to 140 m/sec at altitudes of approximately 50 km. The general motion direction at all altitudes remains constant and coincides with the direction of Venus's rotation. Stable zonal motion of the (latitudinal) enveloping circulation type is believed to exist with a complex wind velocity gradient increase with altitude. Dust content in the Venus atmosphere is discussed, and is shown to be low. Author

N74-33274*# Scientific Translation Service, Santa Barbara, Calif.
MARS-3: PHOTOMETRIC PROFILES OF THE PLANET IN A NEAR-INFRARED SPECTRAL REGION

V. I. Moroz, A. E. Nadzhip, and V. S. Zhegulev Washington NASA Sep. 1974 39 p refs Transl. into ENGLISH of Inst. of Space Res., Acad. of Sci. USSR Report Pr-173, Moscow, 1974 37 p
(Contract NASw-2483)
(NASA-TT-F-15911; Pr-173) Avail: NTIS HC $5.00 CSCL 03B

The brightness of Mars was measured in a narrow spectral interval at a wavelength of about 1.4 microns with a spatial resolution up to 5 km by means of a photometer on board Mars-3. The measurement trajectories intersected the Martian continents, seas, and polar cap. The photometric profiles obtained along the trajectories contain a great many fine details, related both to changes in the albedo and to surface inclinations. The photometric profiles of the continents are well described by the Lambert law. The sea/continent contrasts reached 0.5. It was found that they could be explained either by a difference in the particle dimensions or by the relative content of absorbing material. The optical thickness of dust clouds in the last period of a dust storm in 1971 was determined from the change in the sea/continent contrasts between December 1971 and February 1972. Author

N74-33275*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HEATING ANALYSIS FOR THE PIONEER VENUS MULTI-PROBE MISSION

Kenneth Sutton Jul. 1974 32 p refs
(NASA-TM-X-72001) Avail: NTIS HC $3.25 CSCL 22C

The fully coupled, radiating flow field around the entry probes is determined from a detailed calculation which includes equilibrium chemistry, nongray radiative transport, ablation product injection, and a laminar or turbulent boundary layer. Results show that the radiative flux toward the body is attenuated in the boundary layer at downstream regions of the body as well as at the stagnation point and that, even when radiation absorption by ablation products is accounted for, the radiative heating rates along the downstream regions of the body can, under certain conditions, exceed the stagnation point values. It is also shown that, for Venusian entry, the spectral distribution of radiative flux and the magnitude of radiation absorption by ablation products depend strongly on entry velocity, and that the state of the boundary layer can significantly influence the amount of ablation product absorption or emission that occurs in various spectral regions. Author

N74-33276*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ORBITER/SPACE LAB MOMENTUM MANAGEMENT FOR POP ORIENTATIONS

Jerry W. Cox 21 Jun. 1974 62 p ref
(NASA-TM-X-64873) Avail: NTIS HC $3.75 CSCL 22C

An angular momentum management scheme applicable to the orbiter/spacelab is described. The basis of the scheme is to periodically maneuver the vehicle through a small angle thereby using the gravity gradient torque to dump momentum from the control moment gyro (CMG) control system. The orbiter is operated with its principal vehicle axis perpendicular to the orbital plane. Numerous case runs were conducted on the hybrid simulation and representative cases are included. Author

N74-33277*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB STUDENT PROJECT REPORT

Aug. 1974 75 p
(NASA-TM-X-64866) Avail: NTIS HC $3.75 CSCL 22A

The Skylab Student Project some 4000 students submitted experiments from which twenty-five national winners were selected. Of these, eleven required special flight hardware, eight were allowed to obtain data using hardware available for professional investigations, and the remaining six were affiliated with researchers in alternate fields, since their proposals could not be accommodated due to complexity or similar incompatibility. The background of the project is elaborated and experiment performance results and evaluations are touched upon. Author

N74-33278*# Kanner (Leo) Associates, Redwood City, Calif.
TASK OF PREDICTING THE ROTATIONAL MOTION OF AN UNSYMMETRICAL TWISTED ARTIFICIAL EARTH SATELLITE

V. S. Novoselov, ed., L. K. Babadzhanyants, and L. I. Fedorova Washington NASA Sep. 1974 19 p refs Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 103-113
(Contract NASw-2481)
(NASA-TT-F-15813) Avail: NTIS HC $4.00 CSCL 03C

Equations using osculating elements in the general case of dynamically unsymmetrical bodies are discussed. The case in point is that of an artificial earth satellite in a circular orbit of an altitude on the order of 700 km. Two problems must be solved: refinement of the parameters and initial values, and numerical integration in a given time interval. The Runge-Haine-Kutta method is tested as it applies to derivative unsolved systems. Author

N74-33279*# Kanner (Leo) Associates, Redwood City, Calif.
OPTIMAL DAMPING AND STOCHASTIC CONTROL IN CERTAIN ASTRODYNAMIC PROBLEMS

V. T. Tarushkin and V. S. Novoselov, ed. Washington NASA Aug. 1974 15 p refs Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 114-121
(Contract NASw-2481)
(NASA-TT-F-15814) Avail: NTIS HC $4.00 CSCL 03C

On the basis of controllable Markovian random processes, a theory of optimal damping is constructed. Interference, in this context, pertains to white noise. The application of this theory to the problem of retarding rotation of an aircraft is given. Author

N74-33280*# Kanner (Leo) Associates, Redwood City, Calif.
SELECTION OF A ZERO APPROXIMATION FOR THE POSITION OF AN ARTIFICIAL EARTH SATELLITE IN A PHASE OF ITS ORIENTED MOTION USING A DIPOLE APPROXIMATION OF THE GEOMAGNETIC FIELD

V. S. Novoselov, ed. Washington NASA Aug. 1974 24 p Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 123-138
(Contract NASw-2481)
(NASA-TT-F-15815) Avail: NTIS HC $4.25 CSCL 03C

The problem of defining the zero approximation for the angular position of a round artificial earth satellite of oriented motion is discussed using aircraft angles psi, phi and theta (yaw, bank, pitch, respectively). Trigonometric polynomials of the second power are used in terms of powers of the argument of latitude. Author

N74-33281*# Kanner (Leo) Associates, Redwood City, Calif.
PROBLEM OF SELECTING ZERO APPROXIMATION FOR POSITION OF AN ORIENTED SATELLITE USING NON-

DIPOLE APPROXIMATION OF THE GEOMAGNETIC FIELD
V. S. Novoselov, ed. Washington NASA Aug. 1974 18 p refs Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 139-150
(Contract NASw-2481)
(NASA-TT-F-15816) Avail: NTIS HC $4.00 CSCL 03C

A program of statistical smoothing to the tenth power exclusively was developed; then statistical smoothing for two oriented satellites in circular orbits at altitudes of 250 to 600 cm was carried out. Author

N74-33282*# Kanner (Leo) Associates, Redwood City, Calif.
ON SELECTION OF ZERO APPROXIMATION FOR THE ANGULAR POSITION OF AN ARTIFICIAL EARTH SATELLITE IN THE FORM OF TRIGONOMETRIC POLYNOMIALS TO THE FOURTH POWER
V. S. Novoselov, ed. Washington NASA Aug. 1974 10 p refs Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 173-177
(Contract NASw-2481)
(NASA-TT-F-15820) Avail: NTIS HC $4.00 CSCL 03C

For high earth satellites, the spectral presentation for angles of orientation has comparatively large terms of the third and fourth power. Since in oriented motion the satellite, provided with a damper, is under conditions of forced oscillation, then even the approximating formulas for the angles of orientation can have large coefficients with harmonics of the third and fourth power. Research conducted shows that the use of approximating trigonometric polynomials of high powers also requires additional conditions which are independent of the magnetometer readings. Author

N74-33283*# Kanner (Leo) Associates, Redwood City, Calif.
APPLICATION OF MATHEMATICAL STATISTICS METHODS TO THE STUDY OF ARTIFICIAL EARTH SATELLITE MOVEMENT NEAR THE CENTER OF MASS
N. F. Martynova Washington NASA Aug. 1974 31 p refs Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 83-103
(Contract NASw-2481)
(NASA-TT-F-15812) Avail: NTIS HC $4.75 CSCL 22C

The orientation of an Artificial Earth Satellite (AES) was shown to depend on its position and on perturbing moments of external forces affecting the satellite. Models of these external forces were considered, and the orbital motion of an AES was studied. Author

N74-33284*# Kanner (Leo) Associates, Redwood City, Calif.
ON THE PULSE NUMBER DURING OPTIMAL TRANSFER BETWEEN CLOSE KEPLERIAN ORBITS
V. A. Antonov, A. S. Shmyrov, and V. S. Novoselov, ed. Washington NASA Aug. 1974 9 p refs Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 165-168
(Contract NASw-2481)
(NASA-TT-F-15818) Avail: NTIS HC $4.00 CSCL 03C

In calculating optimal transfers between Keplerian orbits, the maximum number of pulses is given a priori, usually no more than three. Therefore, the question remains as to whether a greater number of pulses will reduce the characteristic velocity. The Pontryagin function is employed to describe a general case. Author

N74-33285*# Kanner (Leo) Associates, Redwood City, Calif.
OPTIMIZATION OF THE DESCENT MANEUVERS OF A SATELLITE MODULE FROM PLANETARY ORBIT
S. N. Kirpichnikov and V. S. Novoselov, ed. Washington NASA Aug. 1974 22 p refs Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 5-19
(Contract NASw-2481)
(NASA-TT-F-15805) Avail: NTIS HC $4.25 CSCL 03C

The optimization of descent maneuvers is calculated to expand the minimum amount of fuel. Certain limitations are taken into account--angle of re-entry, distance between the modules at the finish time, and direct visibility between the modules. It is easy to prove that the optimal descent orbits lie in the plane of the initial orbit. Author

N74-33286*# Kanner (Leo) Associates, Redwood City, Calif.
OPTIMAL TRANSFER IN THE EQUATORIAL PLANE OF AN AXISYMMETRIC PLANET WITH AN ADDITIONAL CLAIM OF ACCURACY
A. N. Kovalenko and V. S. Novoselov, ed. Washington NASA Aug. 1974 16 p refs Transl. into ENGLISH from the book "Mekhanika Upralyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 19-29
(Contract NASw-2481)
(NASA-TT-F-15806) Avail: NTIS HC $4.00 CSCL 03C

A closed system of 22 equations is derived to define the energetically optimal realization of a two pulse transfer between elliptical orbits in the equatorial plane of an axisymmetric planet, with a correction for accuracy. Assuming that the zero approximation is found numerically or otherwise, a less error sensitive transfer is accurately derived, to account for the nonsphericity of the planet in question. Author

N74-33287*# Kanner (Leo) Associates, Redwood City, Calif.
OPTIMAL TRANSFER BETWEEN SLIGHTLY ELLIPTICAL ORBITS WITH AN ADDITIONAL CLAIM OF ACCURACY AND WITH CALCULATION OF NONSPHERICITY
N. N. Kovalenko Washington NASA Aug. 1974 22 p refs Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 29-41
(Contract NASw-2481)
(NASA-TT-F-15807) Avail: NTIS HC $4.25 CSCL 03C

Using the basic system of equations derived in Kovalenko (1972a), the energetically optimal two pulse transfer between elliptical orbits in the equatorial plane of an axisymmetric planet is examined. Dispersion of flyback is studied as a function of various parameters. A single small parameter is selected, alpha (t sub u - t and i) = mu. The Homann ellipse serves as the simulated transfer. Author

N74-33288*# Kanner (Leo) Associates, Redwood City, Calif.
QUADRIMPULSE FLYBACK WITH REVERSION
G. V. Ufimtsev and V. S. Novoselov, ed. Washington NASA Aug. 1974 26 p refs Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 41-57
(Contract NASw-2481)
(NASA-TT-F-15808) Avail: NTIS HC $4.50 CSCL 03C

Quadrimpulse flyback between two points which move along round coplanar orbits uniformly in the same direction is noted. Two pulses are applied in flyback from the first point to the second; two are applied in reverse flyback. A Homann flyback is one whose orbits (there and back) are Homann semi-ellipses. The orbit for which delta F is smallest is the optimal orbit. Author

N74-33289*# Kanner (Leo) Associates, Redwood City, Calif.
OPTIMAL TRANSFER BETWEEN COPLANAR ELLIPTICAL ORBITS USING TANGENTIAL PULSES APPLIED AT APSIDAL POINTS
A. S. Shmyrov Washington NASA Aug. 1974 13 p refs Transl. into ENGLISH from the book "Mekhanika Upravlyayemogo Dvizheniya i Problemy Kosmicheskoy Dinamiki" Leningrad, Leningrad Univ. Press, 1972 p 63-69
(Contract NASw-2481-407)
(NASA-TT-F-15810) Avail: NTIS HC $4.00 CSCL 03C

Numerical methods and numerous analytic studies have been made to solve the problem of optimal pulse transfer between orbits. This study provides a solution of the particular case of the general problem using sufficient conditions of optimacy. The particular case constitutes coplanar elliptical orbits whose apsidal lines coincide. Author

N74-33290*# Dudley Observatory, Albany, N.Y.
NINETY DAY MISSION REPORT FOR SKYLAB EXPERIMENT T025
Donald W. Schuerman 5 Jun. 1974 18 p

(Contract NAS9-12539)
(NASA-CR-140247) Avail: NTIS HC $4.00 CSCL 22C

The problems encountered in the observing programs using the airlock coronagraph (T025) are reported for the atmospheric scattering program, Kohoutek photography, and the spacecraft contamination analysis. The impact of the difficulties on the results is discussed. F.O.S.

N74-33291*# Chicago Univ., Ill.
SPECTROPHOTOMETRY OF COMETS Final Report, Jun. 1965 - Aug. 1974
C. R. Odell Aug. 1974 12 p refs
(Grant NGL-14-001-060)
(NASA-CR-140058) Avail: NTIS HC $4.00 CSCL 03A

Photoelectric spectrophotometric- and image tube equipped spectrographic-studies on comets are used to formulate a new model for the cometary nucleus that is physically similar to the icy-conglomerate. Absolute flux distributions of the principal spectral features for five comets of different compositions and heliocentric distances were evaluated. Comparison of visible and infrared brightnesses was used to calculate the optical albedos of observed particles. G.G.

N74-33292*# Rensselaer Polytechnic Inst., Troy, N.Y.
PARAMETER ESTIMATION FOR TERRAIN MODELING FROM GRADIENT DATA
Kenneth R. DAngelo May 1974 96 p refs
(Grant NGL-33-018-091)
(NASA-CR-140057; RPI-TR-MP-46) Avail: NTIS HC $8.00 CSCL 22A

A method is developed for modeling terrain surfaces for use on an unmanned Martian roving vehicle. The modeling procedure employs a two-step process which uses gradient as well as height data in order to improve the accuracy of the model's gradient. Least square approximation is used in order to stochastically determine the parameters which describe the modeled surface. A complete error analysis of the modeling procedure is included which determines the effect of instrumental measurement errors on the model's accuracy. Computer simulation is used as a means of testing the entire modeling process which includes the acquisition of data points, the two-step modeling process and the error analysis. Finally, to illustrate the procedure, a numerical example is included. Author

N74-33293# Sandia Labs., Albuquerque, N.Mex.
SAFETY PLAN FOR AUSTRALIAN ECLIPSE OPERATION IN JUNE 1974
J. H. Smelser Mar. 1974 160 p refs Sponsored by AEC
(SLA-74-139) Avail: NTIS HC $11.00

During the solar eclipse of June 20, 1974, in western Australia, a team of scientists and engineers from the United States plan to launch a rocket borne solar physics experiment. The purpose is to study the coronal temperature distribution by observing the Lyman alpha line width, in an investigation that can be usefully conducted above the earth's atmosphere only during a total solar eclipse. This report details the plans for the project. Author (NSA)

N74-33294# Royal Greenwich Observatory, Herstmonceux (England).
SECOND GREENWICH CATALOGUE OF STARS FOR 1950.0
K. C. Blackwell and M. E. Buontempo 1973 67 p refs
(Annals-9) Avail: NTIS HC $6.50; Roy. Greenwich Obs., Herstmonceux, Engl. £1.50

The second Greenwich catalog observed right ascensions for 375 FK3 stars and 77 circumpolar stars observed in both culminations (equinox 1950.0, epoch of observation) are presented. Observations were performed with the Cooke reversible transit circle, the history and description of which are detailed. The transfer to Herstmonceux required improvements on the objective, azimuth marks, photographic circle readings, dome, and collimation investigations, which are outlined. The reduction of right ascensions entailed a number of corrections with regard to clock rate, RA micrometer reading of standard contact including half width of stud, RA micrometer screw, parallax of pens of chronograph, curvature of star path, line of collimation, diurnal aberrations, level, and azimuth and clock error. Other corrections not applied are personal equation, zenith discontinuity, RA frame correction, lag of moving wire, inclination of RA wire, RA micrometer screw error, pivot error, annual and diurnal variations of level, azimuth, and collimation. Reasons for not applying the corrections are detailed. ESRO

N74-33295# Royal Greenwich Observatory, Herstmonceux (England). Time and Latitude Service.
GREENWICH TIME REPORT, JULY - SEPTEMBER 1973
Sep. 1973 16 p
Avail: NTIS HC $4.00

Greenwich time and latitude observations for July through September 1973 are presented. Radio time signals and standard frequency emissions are included. ESRO

N74-33296# European Space Research Organization, Paris (France).
PERIODIC AND SECULAR PERTURBATIONS OF ORBITS IN THE VICINITY OF PLANETS
Oskar Bschorr Jun. 1974 50 p refs Transl. into ENGLISH of Periodische u. Saekulare Stoerungen Planetennaher Bahnen, DLR-FB-73-91, DFVLR, 16 Jul. 1973
(ESRO-TT-70; DLR-FB-73-91) Avail: NTIS HC $5.50; DFVLR, Porz, West Ger. 16.70 DM

Orbit perturbations of interplanetary bodies caused by close approach to planets were calculated with the help of an orbit model derived from the flyby procedure used in space flight. In a one-sided flyby the asteroid orbit becomes subject to secular rotation. The speed of rotation is independent of the smallest distance between the orbits, while the direction of the rotation depends on the position of the node. A meteor stream crossed by a planet will therefore be divided into two parts. In a two-sided approach there are only periodic perturbations. In both cases the energy of the orbit remains constant. The perturbations caused by close flybys increase the probability of collisions.
Author (ESRO)

N74-33297# European Space Research Organization, Paris (France).
IMPROVEMENT OF CONVERGENCE IN ORBIT DETERMINATION OF ARTIFICIAL SATELLITES
Martin Eckstein Jun. 1974 37 p refs Transl. into ENGLISH of Konvergenzverbesserung bei der Bahnbestimmung Kuenstlicher Satelliten, DLR-FB-73-95, DFVLR, 2 Aug. 1973
(ESRO-TT-72; DLR-FB-73-95) Avail: NTIS HC $5.00; DFVLR, Porz, West Ger. 12.60 DM

The determination of satellite orbits is, in general, based on an iterative process of fitting a certain orbit model to a given set of observations. It is shown that the convergence of this process can be improved by: (1) introducing magnitudes which can easily be calculated from the commonly used observations, and (2) reducing the number of normal equations to be solved in the method of least squares. The improvement is demonstrated by determining the orbit of two actual satellites. Author (ESRO)

N74-33298# Owens Valley Radio Observatory, Pasadena, Calif.
APERTURE SYNTHESIS OF FORMALDEHYDE ABSORPTION IN Sgr B2
D. H. Rogstad, I. A. Lockhart, and J. B. Whiteoak 1974 21 p refs
(Contract N00014-67-A-0094-0019)
(AD-780923; Rept-1974-8) Avail: NTIS CSCL 03/2

Synthesis observations of the 4830 MHz formaldehyde absorption originating near Sgr B2 have been obtained with a resolution of 20 arcsec in right ascension and 40 arcsec in declination. The velocity resolution was 3.1 km/s. The results suggest that there are at least two absorbing clouds near the source. One cloud has a velocity of 80 km/s and is associated with only one of the two bright continuum components. Another cloud, with a velocity of 65 km/s, overlies the entire continuum distribution. At a velocity of 50 km/s, there is some evidence that a third cloud covers the southernmost region of the source.
Author (GRA)

N74-32506* Kanner (Leo) Associates, Redwood City, Calif.
PROBLEM OF SEARCHING FOR EXTRA-TERRESTRIAL CIVILIZATIONS
V. A. Ambartsumyan *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 62-66 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 266-269 (For availability see N74-32500 22-04)
CSCL 03B

N74-32507* Kanner (Leo) Associates, Redwood City, Calif.
MULTIPLICITY OF INHABITED WORLDS AND THE PROBLEM OF SETTING UP CONTACTS AMONG THEM
I. S. Shklovskiy *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 67-78 Transl. into ENGLISH from the Book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 270-279 (For availability see N74-32500 22-04)
CSCL 03B

N74-32509* Kanner (Leo) Associates, Redwood City, Calif.
SEARCHING FOR EXTRA-TERRESTRIAL CIVILIZATIONS
L. M. Gindilis *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 83-110 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 283-302 (For availability see N74-32500 22-04)
CSCL 03B

N74-32513* Kanner (Leo) Associates, Redwood City, Calif.
ARE INTERSTELLAR FLIGHTS POSSIBLE?
B. K. Fedyushin *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 154-160 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 340-344 (For availability see N74-32500 22-04)
CSCL 03B

N74-32515* Kanner (Leo) Associates, Redwood City, Calif.
SPACE FLIGHTS AND QUESTIONS OF LAW
E. Pepen *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 170-175 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 352-257 (For availability see N74-32500 22-04)
CSCL 22C

N74-32643 Harvard Univ., Cambridge, Mass.
FORCED EQUATORIAL PLANETARY WAVES
Duane E. Stevens *In* Natl. Center for Atmospheric Res. Fellowship in Sci. Computing, Summer 1973 Dec. 1973 p 153-168 refs (For availability see N74-32635 22-08)

N74-33331 Astronomical Inst., Utrecht (Netherlanos). Space Research Lab.
INTRODUCTION TO STELLAR ASTRONOMY
C. DeJager *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 5 p (For availability see N74-33330 22-31)

N74-33332 Astronomical Inst., Utrecht (Netherlanos). Space Research Lab.
FOCAL POINTS OF MODERN STELLAR RESEARCH
C. deJager *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 6 p (For availability see N74-33330 22-31)

N74-33333 Astronomical Inst., Utrecht (Netherlanos). Space Research Lab.
SOME PROBLEMS IN STELLAR ASTRONOMY
H. J. Lamers *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 9 p refs (For availability see N74-33330 22-31)

N74-33334 Observatoire de Marseille (France).
INSTRUMENTATION FOR UV/VISIBLE STELLAR ASTRONOMY FROM SPACE
G. Monnet and A. Gaide (Geneva Obs.) *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 39 p (For availability see N74-33330 22-31)

N74-33335* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE LARGE SPACE TELESCOPE
Stanley Sobieski *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 39 p (For availability see N74-33330 22-31)

N74-33336 Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France). Lab. de Physique Stellaire.
THE SUN. MORPHOLOGY AND PHYSICAL DESCRIPTION
R. Bonnet *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 72 p refs (For availability see N74-33330 22-31)

N74-33338 Bonn Univ. (West Germany). Inst. fuer Astronomie.
INFRARED ASTRONOMY AND STELLAR SOURCES
M. Grewing *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 30 p refs (For availability see N74-33330 22-31)

N74-33339 Bonn Univ. (West Germany). Inst. fuer Astronomie.
INTERSTELLAR MEDIUM. REGIONS H II
M. Grewing *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 34 p refs (For availability see N74-33330 22-31)

N74-33340 Observatoire de Paris-Meudon (France). Dept. d'Astrophysique Fondamentale.
INFRARED ASTRONOMY FOR EXTRA-GALACTIC OBJECTS AND COSMOLOGY
J. L. Puget *In* ESRO The Implications for European Space Propgrammes of the Possibilities of Manned Missions, Part 2 1973 19 p refs (For availability see N74-33330 22-31)

N74-33343 Imperial Coll. of Science and Technology, London (England). Dept. of Physics.
GROUND-BASED INFRARED ASTRONOMY, 5-20 MICRONS
M. J. Selby *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 28 p refs (For availability see N74-33330 22-31)

N74-33344 Queen Mary Coll., London (England). Dept. of Physics.
SOLAR SUB-MILLIMETRE OBSERVATIONS FROM THE GROUND AND FROM SPACE
J. E. Beckman *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 14 p refs (For availability see N74-33330 22-31)

N74-33345* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. Astrophysics branch.
INFRARED TELESCOPES FOR A SPACE OBSERVATORY
F. S. Witteborn *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 22 p refs (For availability see N74-33330 22-31)

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also; 28 Propulsion Systems; and 32 Structural Mechanics.

N74-33299*# Martin Marietta Corp., Denver, Colo.
SPACE TUG THERMAL CONTROL EQUIPMENT THERMAL REQUIREMENTS, CHARACTERISTICS, AND CONSTRAINTS CATALOGUE: USERS GUIDE
Terry L. Ward Apr. 1974 55 p ref
(Contract NAS8-29670)
(NASA-CR-120309; MCR-74-144) Avail: NTIS HC $5.75 CSCL 22B

This manual details the input instructions to the data bank, and explanation of the program and its output. The data bank was developed in satisfaction of two of the study tasks, the equipment thermal requirement catalog and the equipment characteristics and constraints catalog. The data bank contains 109 components within space tug avionics system. Other systems

were not included in the data bank due to the available information, however, with some program modification, other systems could be incorporated into the data bank program. The data bank was developed and checked out and is compatible with the Univac 1108, and the CDC 6500 operating systems. The data contained in the data bank is general in content with emphasis on the component thermal design. The data is applicable to any spacecraft program where the components contained in the data bank can be applied in satisfaction of the system and subsystem requirements. Author

N74-33300*# Martin Marietta Corp., Denver, Colo.
SPACE TUG THERMAL CONTROL EQUIPMENT THERMAL REQUIREMENTS, CHARACTERISTICS AND CONSTRAINTS CATALOGUE
Terry L. Ward Apr. 1974 187 p refs
(Contract NAS8-29670)
(NASA-CR-120310; MCR-74-145) Avail: NTIS HC $12.50 CSCL 22B

The Space Tug Thermal Control Study contained two tasks associated with the cataloging of equipment thermal requirements, physical characteristics and constraints. In satisfaction of these tasks a Data Bank program was developed to provide a means of standardizing the method of cataloging while using the computer to handle the data and format the data into the desired catalogues. During the course of the study 109 components were catalogued and included in the Data Bank. A standardized method was selected for describing each component. Each subsystem of the Avionics System is described on a subsystem header page which describes the types of components included within the subsystem, the quantity requirements, target weights, target power and relative comments. The individual components listed within each subsystem are not necessarily a complete list of candidate items but do represent several of the presently available components for consideration in a Tug application. Author

N74-33301*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
LAUNCH VEHICLE CATALOG OF TESTS AND OPERATIONS
10 Dec. 1973 164 p Prepared by Boeing Co.
(NASA-TM-X-70322; GP-592-Rev-30) Avail: NTIS HC $11.25 CSCL 22B

Revisions to the Apollo/Saturn 5 Launch Vehicle test and operations catalog sheets are presented. The title, descriptions, objectives, and support requirements are included for each sheet. F.O.S.

N74-33302*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
RESULTS OF TESTS TO DETERMINE THE AERODYNAMIC CHARACTERISTICS OF TWO POTENTIAL AEROMANEUVERING ORBIT-TO-ORBIT SHUTTLE (AMOOS) VEHICLE CONFIGURATIONS IN THE NASA-AMES 3.5 FOOT HYPERSONIC WIND TUNNEL Final Report
F. C. Ketter, Jr. May 1974 118 p refs
(Contract NAS8-28608)
(NASA-CR-120423; LMSC-HREC-TR-D306979) Avail: NTIS HC $9.00 CSCL 22C

An aerodynamic wind tunnel investigation was conducted in the NASA-Ames Research Center (ARC) 3.5-foot hypersonic facility to provide data for use in obtaining experimental force and static stability characteristics of two potential aeromaneuvering orbit-to-orbit shuttle (AMOOS) vehicle configurations. The experimental data were compared with the aerodynamic characteristics estimated using Newtonian theory, thus establishing the usefulness of these predictions. The candidate AMOOS configurations selected for the wind tunnel tests were the AMOOS 5B and HB configurations. Two flap configurations were tested for each candidate - a forward or compression surface flap and an aft or expansion flap. Photographs and sketches of the two configurations with different control surfaces are shown. It was determined that Newtonian theory generally predicted the aerodynamics of the 5B configuration with acceptable accuracy for all expansion flap deflections and for compression flap deflections less than or equal to 10 degrees. Flow separation upstream of large compression flap deflections was detected from the experimental data. Author

N74-33303*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE VEHICLE SYSTEM Patent Application
Maxine A. Faget, William W. Petynia, and Willard M. Taub, inventors (to NASA) Filed 5 Mar. 1974 23 p
(NASA-Case-MSC-12561-1; US-Patent-Appl-SN-448323) Avail: NTIS HC $4.25

A space vehicle system consisting of an orbiter vehicle with an expendable propellant tank attached to its underside surface is reported. An engine module is retractably supported from the aft end of the orbiter vehicle and extends beneath it so as to be in axial alignment with the propellant tank when in operation. After the engine has consumed the propellant, it is retracted into the orbiter vehicle and the tank is jettisoned thus reducing orbiter weight and improving flight characteristics. NASA

N74-33304*# McDonnell Aircraft Co., St. Louis, Mo.
A STUDY OF THE FEASIBILITY OF DIRECTLY APPLYING GAS GENERATOR SYSTEMS TO SPACE SHUTTLE MECHANICAL FUNCTIONS
E. R. Lake Washington NASA Sep. 1974 62 p refs
(Contract NAS1-11740)
(NASA-CR-2454) Avail: NTIS HC $3.75 CSCL 22B

This study examined the current status and potential application of pyrotechnic gas generators and energy convertors for the space shuttle program. While most pyrotechnic devices utilize some form of linear actuation, only limited use of rotary actuators has been observed. This latter form of energy conversion, using a vane-type actuator as optimum, offers considerable potential in the area of servo, as well as non-servo systems, and capitalizes on a means of providing prolonged operating times. Pyrotechnic devices can often be shown to provide the optimum means of attaining a truly redundant back-up to a primary, non-pyrotechnic system. Author

N74-33305*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APOLLO-SKYLAB CONTAMINATION PHOTOGRAPHY (S226) Final Report
P. D. Craven and G. A. Gary 15 Jun. 1974 99 p refs
(NASA-TM-X-70354; M-SSL-74-1) Avail: NTIS HC $4.00 CSCL 22B

Photographs taken on Apollo 16 before, during, and after a water dump were analyzed for residual background brightness, particle dynamics, and time decay of background brightness. No conclusive results were obtained because of the illumination of the windows or window openings by extraneous light sources. Author

N74-33306*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PIONEER VENUS ORBITER
Aug. 1974 24 p refs
(NASA-TM-X-62378) Avail: NTIS HC $4.25 CSCL 22B

The orbiter mission of the Pioneer Venus probe is discussed. In accordance with the low-cost Pioneer Venus concept, NASA intends to use the same basic spacecraft, known as the bus, for the execution of the two missions. The bus will be equipped with all of the subsystems common to the probe and orbiter missions (for example, thermal control, solar cells and power supply, attitude measurement and control, telemetry and communication electronics, and auxiliary propulsion unit). For the 1977 mission, the bus will be equipped with the large and small probes and a special antenna system. For the orbiter mission, the bus will be equipped with a retro-propulsion motor and a high-gain antenna. A diagram of the system envisaged is shown. Author

N74-33307*# Chrysler Corp., New Orleans, La. Space Div.
WIND TUNNEL TEST OF THE 0.019 (2A CONFIGURATION) JET PLUME SPACE SHUTTLE INTEGRATED VEHICLE IN THE ARC 9- BY 7-FOOT UNITARY WIND TUNNEL (IA12B)
R. B. Hardin (Rockwell Intern. Corp., Downey, Calif.) and R. R. Burrows (Rockwell Intern. Corp., Downey, Calif.) Jul. 1974 943 p refs
(Contract NAS9-13247)
(NASA-CR-134104; DMS-DR-2048) Avail: NTIS HC $50.25

CSCL 22B

The wind tunnel test of the 0.019 jet plume space shuttle integrated vehicle in the Ames 9 ft by 7 ft unitary wind tunnel was conducted at Mach numbers of 1.55 and 2.0 over a Reynolds number range from 3.5 million to 4.1 million/ft. Data were obtained at angles of attack from minus 8 deg to plus 8 deg at 0 deg sideslip and at angles of sideslip from minus 9 deg to plus 8 deg at 0 deg angle of attack. The basic configuration tested was the 2A vehicle with the orbiter at 0 deg angle of incidence with respect to the external tank. The other deviations to the 2A configuration were the solid rocket motor shrouds, which were designed to vehicle '3' lines, and the tank nose, which consisted of the retro-package being removed and replaced by a 16.5 inch full scale radius nose. Author

N74-33308*# Chrysler Corp., New Orleans, La. Space Div.
INVESTIGATION OF SPACE SHUTTLE ORBITER SUBSONIC STABILITY AND CONTROL CHARACTERISTICS IN THE NAAL LOW SPEED WIND TUNNEL (OA62B), VOLUME 2
Robert Mennell (Rockwell Intern. Corp., Los Angeles.) and Terrance Hughes (Rockwell Intern. Corp., Los Angeles.) Jul. 1974 1051 p refs
(Contract NAS9-13247)
(NASA-CR-134113; DMS-DR-2104-Vol-2) Avail: NTIS HC $55.75 CSCL 22B

Experimental aerodynamic investigations were conducted on a sting-mounted 0.0405 scale representation of the 140A/B space shuttle orbiter in a 7.75 ft by 11 ft low speed wind tunnel during the period from November 14, 1973 to December 6, 1973. Establishment of basic longitudinal stability characteristics in and out of ground effect, and the establishment of lateral-directional stability characteristics in free air were the primary test objectives. The following effects and configurations were tested: (1) two dual podded nacelle configurations; (2) stability and control characteristics at nominal elevon deflections, rudder deflections, airleron deflections, rudder flare angles, and body flap deflections; (3) effects of various elevon and elevon/fuselage gaps on longitudinal stability and control; (4) pressures on the vertical tail at spanwise stations using pressure bugs; (5) aerodynamic force and moment data measured in the stability axis system by an internally mounted, six-component strain gage balance. For Vol. 1, see N74-32324. Author

N74-33309*# Martin Marietta Corp., Denver, Colo.
SPACE TUG THERMAL CONTROL. Final Report, 1 Jul. 1973 - 30 Apr. 1974
Sep. 1974 263 p refs
(Contract NAS8-29670)
(NASA-CR-120443; MCR-74-147) Avail: NTIS HC $16.25 CSCL 22B

It was determined that space tug will require the capability to perform its mission within a broad range of thermal environments with currently planned mission durations of up to seven days, so an investigation was conducted to define a thermal design for the forward and intertank compartments and fuel cell heat rejection system that satisfies tug requirements for low inclination geosynchronous deploy and retrieve missions. Passive concepts were demonstrated analytically for both the forward and intertank compartments, and a worst case external heating environment was determined for use during the study. The thermal control system specifications and designs which resulted from the research are shown. Author

N74-33310*# Martin Marietta Corp., Denver, Colo.
SPACE TUG THERMAL CONTROL Summary Report, 1 Jul. 1973 - 30 Apr. 1974
Sep. 1974 28 p refs
(Contract NAS8-29670)
(NASA-CR-120442; MCR-74-146) Avail: NTIS HC $4.50 CSCL 22B

For abstract, see N74-33309.

N74-33311# Weapons Research Establishment, Salisbury (Australia).
PROJECT AEROBEE, 1973 FIRINGS AT WOOMERA: TRAILS WINGS PLANNING SPECIFICATION NO. 16
Jul. 1973 30 p
(TWPS-16; F6110/4/2) Avail: NTIS HC $4.50

The requirements and plans for launching the 1973 Aerobee rocket vehicles at the Woomera Test Range are discussed. The subjects considered are: (1) agreements and participating agencies, (2) trials requirements, (3) trials plan, and (4) project administration. The information required from the trials and the instrumentation required is reported. Author

N74-33312*# International Business Machines Corp., Huntsville, Ala. Federal Systems Div.
SPACELAB SOFTWARE DEVELOPMENT AND INTEGRATION CONCEPTS STUDY REPORT, VOLUME 1
P. L. Rose and B. G. Willis 31 Oct. 1973 103 p refs
(Contract NAS8-30376)
(NASA-CR-120409; IBM-73W-00326-Vol-1) Avail: NTIS HC $8.25 CSCL 22B

The proposed software guidelines to be followed by the European Space Research Organization in the development of software for the Spacelab being developed for use as a payload for the space shuttle are documented. Concepts, techniques, and tools needed to assure the success of a programming project are defined as they relate to operation of the data management subsystem, support of experiments and space applications, use with ground support equipment, and for integration testing. A.A.D.

N74-33313*# International Business Machines Corp., Huntsville, Ala. Federal Systems Div.
SPACELAB SOFTWARE DEVELOPMENT AND INTEGRATION CONCEPTS STUDY REPORT. VOLUME 2: APPENDICES
31 Oct. 1973 130 p refs
(Contract NAS8-30376)
(NASA-CR-120410; IBM-73W-00327-Vol-2-App) Avail: NTIS HC $9.50 CSCL 22B

Software considerations were developed for incorporation in the spacelab systems design, and include management concepts for top-down structured programming, composite designs for modular programs, and team management methods for production programming. A.A.D.

N74-33314*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF TESTS IN THE NASA/LaRC 31 INCH CFHT ON AN 0.010-SCALE MODEL (32-OT) OF THE SPACE SHUTTLE CONFIGURATION 3 TO OBTAIN HYPERSONIC AERODYNAMIC CHARACTERISTICS FOR SECOND STAGE OPERATION DURING NOMINAL BOOST AND THE ABORT RTLS MODE (IA58)
D. E. Thornton (Rockwell Intern., Downey, Calif.) Jul. 1974 101 p
(Contract NAS9-13247)
(NASA-CR-134110; DMS-DR-2133) Avail: NTIS HC $8.25 CSCL 22B

Tests were conducted to obtain hypersonic aerodynamic forces and moments on an 0.010-scale model of the space shuttle vehicle configuration 3. Hypersonic stability data were obtained from tests at Mach 10.3 and dynamic pressure of 150 psf for the integrated orbiter and external tank, orbiter alone, and external tank alone. The effects of solid plume simulation from the main propulsion system as well as elevon, aileron, and rudder deflections were also investigated. Author

N74-33315*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF TESTS IN THE NASA/LaRC 31-INCH CFHT ON AN 0.010-SCALE MODEL (32-OT) OF THE SPACE SHUTTLE CONFIGURATION 3 TO DETERMINE THE RCS JET FLOWFIELD INTERACTION EFFECTS ON AERODYNAMIC CHARACTERISTICS (IA60/0A105), VOLUME 2
D. E. Thornton (Rockwell Intern., Downey, Calif.) Jun. 1974 287 p
(Contract NAS9-13247)
(NASA-CR-134106; DMS-DR-2137-Vol-2) Avail: NTIS HC $17.50 CSCL 22B

Tests were conducted in the NASA Langley Research Center 31-inch continuous flow hypersonic wind tunnel from 14 February to 22 February 1974, to determine RCS jet interaction effect on the hypersonic aerodynamic and stability and control characteristics prior to RTLS abort separation. The model used was an 0.010-scale replica of the space shuttle vehicle configura-

tion 3. Hypersonic stability data were obtained from tests at Mach 10.3 and dynamic pressure of 150 psf for the intergrated orbiter and external tank and the orbiter alone. RCS modes of pitch, yaw, and roll at free flight dynamic pressure simulation of 7, 20, and 50 psf were investigated. The effects of speedbrake, bodyflap, elevon, and aileron deflections were also investigated.
Author

N74-33316*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A COMPUTER SIMULATION OF SKYLAB DYNAMICS AND ATTITUDE CONTROL FOR PERFORMANCE VERIFICATION AND OPERATIONAL SUPPORT
Harry Buchanan, Douglas Nixon, and Ron Joyce (Northrop Services, Inc., Huntsville, Ala.) Sep. 1974 21 p refs
(NASA-TM-X-64876) Avail: NTIS HC $3.00 CSCL 22B

A simulation of the Skylab attitude and pointing control system (APCS) is outlined and discussed. Implementation is via a large hybrid computer and includes those factors affecting system momentum management, propellant consumption, and overall vehicle performance. The important features of the flight system are discussed; the mathematical models necessary for this treatment are outlined; and the decisions involved in implementation are discussed. A brief summary of the goals and capabilities of this tool is also included. Author

N74-33317*# Linguistic Systems, Inc., Cambridge, Mass.
SUCH WILL BE OUR SHIP
B. Zhadonov and N. Yuzhov Washington NASA Sep. 1974 18 p Transl. into ENGLISH from Aviat Kosmonavt. (USSR), no. 4, Apr. 1974 p 34-35
(Contract NASw-2482)
(NASA-TT-F-15791) Avail: NTIS HC $4.00 CSCL 22B

A description of the Soyuz spacecraft which will participate in a cooperative mission with the U.S. spacecraft Apollo is presented. A diagram of the Soyuz spacecraft is included. Explanations and a chronological table of previous Soyuz, Cosmos, Molniya, and Oreol missions in 1973 to 1974 are provided.
Author

N74-33318*# Linguistic Systems, Inc., Cambridge, Mass.
OBSERVATIONS BY ARTIFICIAL SATELLITES AND PROBES
N. P. Yerpylev et al Washington NASA Sep. 1974 93 p Transl. into ENGLISH from Nablyudeniya Iskusst. Nebesnykh Tel (Moscow), no. 63, 1973 p 1-51
(Contract NASw-2482)
(NASA-TT-F-15788) Avail: NTIS HC $7.75 CSCL 22C

A compilation of artificial earth satellites and space probes launched from January 1, through December 31, 1970 is presented. Tables of data are provided which show the country which launched the satellite, the designation, the date of launch and length of existence, slope of the orbit to the equator, the period, and the perigee and apogee of the orbits. Author

N74-33319*# Chrysler Corp., New Orleans, La. Space Div.
STATIC AND CONTROL INVESTIGATIONS OF AN 0.030-SCALE SPACE SHUTTLE ORBITER CONFIGURATION 140A/B MODEL IN THE AMES RESEARCH CENTER 11 BY 11-FOOT TRANSONIC WIND TUNNEL (OA53A), VOLUME 1
Mark E. Nichols (Rockwell Intern., Downey, Calif.) Jul. 1974 974 p refs 2 Vol.
(Contract NAS9-13247)
(NASA-CR-134114; DMS-DR-2128-Vol-1) Avail: NTIS HC $51.75 CSCL 22B

A wind tunnel test of an 0.030 scale model of the Rockwell International Configuration 140A/B Space Shuttle Vehicle Orbiter were conducted in the Ames Research Center 11- by 11-Foot Transonic Wind Tunnel. This part (part A) of test series 0A53 was conducted at Mach numbers of 0.6, 0.8, 0.9, 1.05, and 1.20, and at Reynolds numbers from 1.8 x to 6.5 million per foot. The objective of this test was to establish and verify longitudinal and lateral-directional aerodynamic performance, stability, and control characteristics for the Configuration 140A/B SSV Orbiter. Reynolds number studies were performed for certain nominal control-settings. An alternate leading-edge wing configuration and sealed elevon-split arrangement were tested. Bodyflap, elevon, speedbrake, and rudder hinge moments were measured in addition to standard six-component forces and moments and base pressure data. Furthermore, six-component force and moment data were measured for the vertical tail assembly. Author

N74-33320*# Chrysler Corp., New Orleans, La. Space Div.
STATIC AND CONTROL INVESTIGATIONS OF AN 0.030-SCALE SPACE SHUTTLE ORBITER CONFIGURATION 140A/B MODEL IN THE AMES RESEARCH CENTER, 11 BY 11-FOOT TRANSONIC WIND TUNNEL (OA53A), VOLUME 2
Mark E. Nichols (Rockwell Intern., Downey, Calif.) Jul. 1974 852 p refs 2 Vol.
(Contract NAS9-13247)
(NASA-CR-134115; DMS-DR-2128-Vol-2) Avail: NTIS HC $45.75 CSCL 22B

For abstract, see N74-33319.

N74-33321*# Chrysler Corp., New Orleans, La. Space Div.
HEAT TRANSFER TESTS OF AN 0.006-SCALE THIN SKIN SPACE SHUTTLE THERMOCOUPLE MODEL (41-0) IN THE LANGLEY RESEARCH CENTER VARIABLE DENSITY TUNNEL AT M EQUALS 8 (OH13)
D. G. Walstad (Rockwell Intern., Downey, Calif.) Aug. 1974 243 p
(Contract NAS9-13247)
(NASA-CR-134101; DMS-DR-2096) Avail: NTIS HC $15.25 CSCL 22B

Orbiter entry heating distributions were obtained, and phase change paint data was correlated with thermocouple data during a program of heat transfer testing on a 0.006 scale space shuttle orbiter vehicle. The orbiter was tested at 0, 30, and 35 degrees angle of attack at Reynolds numbers of 1, 2, 3, 4, and 6 million per foot. Temperature data were obtained from a total of 57 thermocouples. Author

N74-33322*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF TRANSONIC WIND TUNNEL TESTS ON AN 0.015-SCALE SPACE SHUTTLE MATED VEHICLE MODEL (67-OTS) IN THE LaRC 8 FOOT TPT (IA41)
R. Hardin (Rockwell Intern., Downey, Calif.) and R. R. Burrows (Rockwell Intern., Downey, Calif.) Jul. 1974 400 p refs
(Contract NAS9-13247)
(NASA-CR-134108; DMS-DR-2118) Avail: NTIS HC $23.00 CSCL 22B

Wind tunnel tests were conducted to obtain aerodynamic force data for Mach numbers from 0.60 to 1.20. Data were obtained for an alpha range of -10 deg to +10 deg (beta = 0 deg beta = 5 deg) and beta range of -10 deg to +10 deg (alpha = 0 deg). Longitudinal and lateral-directional stability and control data were obtained for tank alone, tank plus SRB's, tank plus Orbiter, and mated configuration of tank + Orbiter + SRB's. Also, single-component rudder hinge moment data were obtained at rudder deflections of 0 and -20 deg for each Mach number tested. Plots of aerodynamic coefficients vs. Mach number are presented, using data from both test IA41 and tests LRC-UPWT-1056, 1073 (IA42A/B) for Mach numbers of 1.60 to 4.63. The model tested in IA42A/B was the same model as tested in IA41. Author

N74-33323*# Kanner (Leo) Associates, Redwood City, Calif.
THE ATMOSPHERE AND THE CONTROL OF FLIGHT VEHICLE MOTION
Ye. P. Shkolnyy and L. A. Mayboroda NASA Sep. 1974 326 p refs Transl. into ENGLISH of the book "Atmosfera i Upravleniye Dvizheniyem Letatel'nykh Apparatov" Leningrad, Gidrometeoizat, 1973 307 p
(Contract NASw-2481)
(NASA-TT-F-15909) Avail: NTIS HC $19.50 CSCL 22A

An analysis is given of the stochastic characteristics of the physical parameters of the atmosphere in the lower 100 km layer based on a statistical treatment of rocket sounding data. Models of the random components of the physical parameters of the atmosphere are developed. They are used in investigating the control of flight vehicle motion in the earth's atmosphere. Stochastic models of flight vehicle motion are examined and methods of the statistical analysis of the scatter of trajectories

are proposed, along with methods of evaluating the effect of atmospheric perturbations on flight vehicle motion and methods of the statistical optimization of flight vehicle control systems.
Author

N74-33324*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
TECHNICAL SUPPORT FOR GUIDANCE, NAVIGATION AND CONTROL SPACE SHUTTLE PROGRAM Final Report, 1 Nov. 1972 - 31 Aug. 1974
23 Aug. 1974 130 p refs
(Contract NAS9-13207)
(NASA-CR-140231; Rept-74-SD-34) Avail: NTIS HC $9.50 CSCL 22B

A review of the guidance, navigation and control projects in support of the space shuttle program was conducted. The subjects considered include the following: (1) functional and performance requirements, (2) mission requirements, (3) operating systems software definition, (4) orbit navigation using various sensors, (5) fault detection, isolation and recovery, and (6) passive rendezvous sensors requirements definition.
Author

N74-33325*# Chrysler Corp., New Orleans, La. Space Div.
INVESTIGATIONS ON AN 0.030-SCALE SPACE SHUTTLE VEHICLE CONFIGURATION 140A/B ORBITER MODEL IN THE AMES RESEARCH CENTER 9 BY 7-FOOT SUPERSONIC WIND TUNNEL (OA53B)
Mark E. Nichols (Rockwell Intern., Downey, Calif.) Jul. 1974 743 p refs
(Contract NAS9-13247)
(NASA-CR-134119; DMS-DR-2178) Avail: NTIS HC $4.25 CSCL 22B

A wind tunnel test of an 0.030-scale space shuttle vehicle orbiter configuration 140A/B model was conducted in the Ames Research Center 9- by 7-foot supersonic wind tunnel. This part of test series OA53 was conducted at Mach numbers of 1.60 and 2.00 and at Reynolds numbers ranging from 1.0 million per foot to 4.0 million per foot. The objective was to establish and verify longitudinal and lateral-directional aerodynamic performance, stability, and control characteristics for the configuration 140A/B SSV orbiter. Reynolds number studies were performed on certain nominal control-setting configurations, and examinations were made of the incremental effects of an alternate wing leading-edge configuration and of a sealed elevon-split construction. Six-component force and moment data, base and cavity pressures, bodyflap, elevon, speedbrake, and rudder hinge moments, and vertical tail forces and moments were measured for the orbiter.
Author

N74-33326# European Space Research Organization, Paris (France).
THE IMPLICATIONS FOR EUROPEAN SPACE PROGRAMMES OF THE POSSIBILITIES OF MANNED MISSIONS. 1: INTRODUCTORY SESSION
1973 90 p Proc. of the ESRO Summer School 1973 4 Vol.
Avail: NTIS HC $7.50

The spacelab program is reviewed, particularly with regard to scientific experiments, components, design and development phases, shuttle/spacelab interfaces, user requirements, and ESRO-NASA cooperation. Spacelab capabilities for payload accommodation and ways of meeting user requirements through design modifications are dealt with. For individual titles, see N74-33327 through N74-33329.

N74-33327 European Space Research Organization, Paris (France). Div. of Programmes and Planning.
EVOLUTION OF THE SPACE ACTIVITIES IN EUROPE LEADING TO THE PERFORMANCE OF MANNED MISSION, SUMMARY
J. A. Dinkespiler *In its* The Implications for European Space Programmes of the Possibilities of Manned Missions, 1 1973 4 p (For availability see N74-33326 22-31)

The development of European space programs leading to manned missions programs is reviewed.
ESRO

N74-33328 European Space Research Organization, Paris (France). Spacelab Programme Office.
THE SPACELAB PROGRAMME
D. J. Shapland *In its* The implications for European Space Programmes of the Possibilities of Manned Missions, 1 1973 34 p (For availability see N74-33326 22-31)

The spacelab program, an integral part of the space shuttle program, is reviewed. Scientific experiments, spacelab components, design and development phases, shuttle/spacelab interfaces, user requirements, concepts proposed by contractors, ESRO-NASA cooperation, and program needs are discussed briefly.
ESRO

N74-33329 European Space Research Organization, Paris (France). Div. of Programmes and Planning.
SPACELAB CAPABILITIES FOR PAYLOAD ACCOMMODATION AND USER ASPECTS
A. Lemarchand *In its* The Implications for European Space Programmes of the Possibilities of Manned mission, 1 1973 40 p (For availability see N74-33326 22-31)

The spacelab configuration and the support assumed to be provided by spacelab for different types of payloads are discussed. User requirements and ways of meeting these requirements through design modifications are dealt with.
ESRO

N74-33330# European Space Research Organization, Paris (France).
THE IMPLICATIONS FOR EUROPEAN SPACE PROGRAMMES OF THE POSSIBILITIES OF MANNED MISSIONS. PART 2: UV, VISIBLE ASTROMOMY, INFRARED ASTRONOMY
1973 407 p refs Proc. of the ESRO Summer School, 1973 4 Vol.
Avail: NTIS HC $23.50

Ultraviolet and visible astronomy are discussed, notably spaceborne instrumentation, large space telescope, solar physics, and solar spectroscopic investigations. Infrared astronomy topics include stellar sources, interstellar medium, H2 regions, extragalactic objects, radiative processes, instrumental problems, ground-based observations, submillimeter solar observations, and spaceborne infrared telescopes. For individual titles, see N74-33331 through N74-33346.

N74-33331 Astronomical Inst., Utrecht (Netherlanos). Space Research Lab.
INTRODUCTION TO STELLAR ASTRONOMY c30
C. DeJager *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 5 p (For availability see N74-33330 22-31)

Stellar astronomy, notably its classification, measurement of the main stellar parameters, evolution, and agglomerates, is introduced. Stellar parameters include mass, radius, luminosity, and effective temperature. Stellar evolution is described by evolution tracks in the Herzsprung-Russell diagram. A short history of the galaxy is given.
ESRO

N74-33332 Astronomical Inst., Utrecht (Netherlanos). Space Research Lab.
FOCAL POINTS OF MODERN STELLAR RESEARCH c30
C. deJager *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 6 p (For availability see N74-33330 22-31)

Spectral lines of and convective motions in the solar chromosphere are dealt with. It is shown that no star heavier than 40 solar masses exists. The origin of solar and stellar flares is discussed. The evolution of close double stars is elaborated.
ESRO

N74-33333 Astronomical Inst., Utrecht (Netherlanos). Space Research Lab.
SOME PROBLEMS IN STELLAR ASTRONOMY c30
H. J. Lamers *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 9 p refs (For availability see N74-33330 22-31)

Structure and motions of stellar atmospheres and mass loss from single stars are discussed. Model atmospheres based on four assumptions are outlined. Both large scale and small scale motions in stellar atmospheres are dealt with. Mass loss considerations include radiation pressure and convection zones.
ESRO

N74-33334 Observatoire de Marseille (France).
INSTRUMENTATION FOR UV/VISIBLE STELLAR ASTRONOMY FROM SPACE **c30**
G. Monnet and A. Gaide (Geneva Obs.) *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 39 p (For availability see N74-33330 22-31)

Advantages of space over ground astronomy are detailed, including larger spectral coverage, better imagery and detectability, and extended observing time. Instrumental components for UV astronomy are discussed, notably optical elements and telescopes. Some aspects of calibration problems are outlined. Instrumental packages for low spectral and high spectral resolution and for imagery of extended sources are dealt with. ESRO

N74-33335* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE LARGE SPACE TELESCOPE **c30**
Stanley Sobieski *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 39 p (For availability see N74-33330 22-31)

The large scale telescope (LST) intended as a permanent international facility to be placed in near earth orbit to perform astronomical observations, is discussed. The basic elements of the LST are detailed, and the modulation transfer function is presented. Both basic and special instruments are dealt with. The sensor parameters are listed, and the choice of the SEC Vidicon is justified. ESRO

N74-33336 Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France). Lab. de Physique Stellaire.
THE SUN. MORPHOLOGY AND PHYSICAL DESCRIPTION **c30**
R. Bonnet *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 72 p refs (For availability see N74-33330 22-31)

The generation of solar energy, including carbon cycle and proton-proton chain, is dealt with. The energy transport in the sun, with emphasis on radiative and conductive effects, is outlined, and the outer layers of the living sun are discussed. The solar magnetic field is dealt with, notably observational evidence, effect of the magnetic fields on the solar plasma, and the effect on the heating of the corona. In addition, the solar activity is discussed. ESRO

N74-33337 Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France). Lab. de Physique Stellaire.
A SPACECRAFT PAYLOAD FOR SOLAR SPECTROSCOPIC INVESTIGATION **c14**
P. Lemaire *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 18 p refs (For availability see N74-33330 22-31)

Visible light-near ultraviolet (1200-7000 A) and a telescope spectrograph are described. After elaboration of the principle of computation, a telescope mounting was computed. Choice of the type of spectrograph is explained and the three-channel spectrograph is described. General performances of the instrumentation are also indicated. ESRO

N74-33338 Bonn Univ. (West Germany). Inst. fuer Astronomie.
INFRARED ASTRONOMY AND STELLAR SOURCES **c30**
M. Grewing *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 30 p refs (For availability see N74-33330 22-31)

Stellar infrared sources, including the topic star formation, protostars, and mass loss from stars, are discussed. Observational results on circumstellar shells, planetary nebular, dust in extended regions, and cool stars are presented. Model calculations for radiative transfer in a protostar envelope were made. ESRO

N74-33339 Bonn Univ. (West Germany). Inst. fuer Astronomie.
INTERSTELLAR MEDIUM. REGIONS H II **c30**
M. Grewing *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 34 p refs (For availability see N74-33330 22-31)

Observations and theoretical considerations on the interstellar medium, notably H2 regions, are given. Observations include optical, radioastronomical and ultraviolet techniques. Model calculations on heating mechanisms, cooling mechanisms, and an X-ray heated cloud medium are dealt with. The interstellar medium in H2 regions is also discussed. ESRO

N74-33340 Observatoire de Paris-Meudon (France). Dept. d'Astrophysique Fondamentale.
INFRARED ASTRONOMY FOR EXTRA-GALACTIC OBJECTS AND COSMOLOGY **c30**
J. L. Puget *In* ESRO The Implications for European Space Propgrammes of the Possibilities of Manned Missions, Part 2 1973 19 p refs (For availability see N74-33330 22-31)

General features of the infrared emission from galaxies and quasars are discussed. Models for these infrared sources are dealt with, including dust emission, synchrotron emission, proton synchrotron, and plasma reactor. The big bang cosmologic model is presented, and topics such as red shift as an infrared source, Seyfert nuclei, contribution from quasars, and star light from young galaxies are discussed. ESRO

N74-33341 Observatoire de Paris-Meudon (France). Section d'Astrophysique.
PHYSICAL MECHANISMS OF INFRARED RADIATIVE PROCESSES **c29**
P. Lena *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 24 p refs (For availability see N74-33330 22-31)

General data on infrared radiative transfer are given. Absorption and emission of infrared photons, including atomic continuous absorption, molecular continuous absorption, discrete atomic transitions, discrete molecular transitions, and the absorption coefficient of solid particles are discussed. Nonthermal processes of infrared radiation and red shift production of IR photons are dealt with. ESRO

N74-33342 Imperial Coll. of Science and Technology, London (England). Dept. of Physics.
OBSERVATIONS IN INFRARED ASTRONOMY. REVIEW OF EXPERIMENTAL RESULTS, TECHNIQUES, AND INSTRUMENTAL PROBLEMS **c14**
J. Ring *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 24 p (For availability see N74-33330 22-31)

Experimental results, techniques, and instrumental problems of infrared astronomy are discussed, with particular reference to the earth atmosphere as an infrared window, infrared telescopes, photon processors, and bolometers as detectors. Outstanding problems in infrared astronomy are listed. ESRO

N74-33343 Imperial Coll. of Science and Technology, London (England). Dept. of Physics.
GROUND-BASED INFRARED ASTRONOMY, 5-20 MICRONS **c30**
M. J. Selby *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 28 p refs (For availability see N74-33330 22-31)

Ground observation of infrared objects is discussed. Infrared sources in galaxies, planetary nebulae, and diffuse H2 regions are dealt with. Ground based observing equipment, sky chopping, atmospheric noise at 10 microns, photometer optical design, infrared mapping, and infrared spectrometery are described. ESRO

N74-33344 Queen Mary Coll., London (England). Dept. of Physics.
SOLAR SUB-MILLIMETRE OBSERVATIONS FROM THE GROUND AND FROM SPACE **c30**
J. E. Beckman *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 14 p refs (For availability see N74-33330 22-31)

Techniques for solar submillimeter observations are discussed. Bolometer detection, absolute radiometry, spectral scanning, and spatial resolution are included. Current infrared results are discussed and interpreted. ESRO

N74-33345* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. Astrophysics

branch.

INFRARED TELESCOPES FOR A SPACE OBSERVATORY **c30**

F. S. Witteborn *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 22 p refs (For availability see N74-33330 22-31)

A cryogenically cooled infrared telescope of 1 to 2 meter aperture is discussed. Advantages of the space environment are detailed, and design considerations for cooled telescopes are given, leading to a schematic and preliminary design of a telescope for the space shuttle. The advantages of the sortie mode to an infrared observatory are dealt with and possible use of an ambient temperature telescope is discussed. Costs of infrared telescope observation are indicated. ESRO

N74-33346 Queen Mary Coll., London (England). Dept. of Physics.

TELESCOPES FOR INFRARED ASTRONOMY FROM SPACE **c14**

J. E. Beckman *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, Part 2 1973 20 p refs (For availability see N74-33330 22-31)

Proposals of the ESRO Post-Apollo Infrared Group for instrumentation for infrared observations from space are presented. Telescopes are listed and detailed. Important features of the three preferred telescopes are outlined. ESRO

N74-33347# European Space Research Organization, Paris (France).

THE IMPLICATIONS FOR EUROPEAN SPACE PROGRAMMES OF THE POSSIBILITIES OF MANNED MISSIONS. 3: ATMOSPHERIC SCIENCES

1973 233 p refs Proc. of the ESRO Summer School 1973 4 Vol.

Avail: NTIS HC $14.75

Atmospheric science topics, including atmospheric pollution, climate, composition of mesosphere and thermosphere, remote sounding, environmental parameters and laser sounding are presented. The use of spacelab for studying the earth's atmosphere is discussed. For individual titles, see N74-33348 through N74-33354. ESRO

N74-33348 Oxford Univ. (England). Dept. of Physics.

INTRODUCTION TO THE ATMOSPHERE **c13**

J. T. Houghton *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 8 p (For availability see N74-33347 22-31)

Various gross parameters for the earth atmosphere are compared with those for the atmospheres of Venus and Mars. The mean structure in the vertical is discussed and atmospheric motion functions are given. The Global Atmospheric Research Programme is outlined. ESRO

N74-33349 Ludwig-Maximilians-Universitat, Munich (West Germany). Inst. fuer Meteorologie.

SPECTRAL SIGNATURES OF MINOR ATMOSPHERIC CONSTITUENTS AND EXPERIMENTAL POSSIBILITIES TO USE THEM FOR POLLUTION MONITORING **c13**

H. J. Bolle *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 100 p refs (For availability see N74-33347 22-31)

The occurrence of minor constituents in the earth's atmosphere and methods of using them for air pollution monitoring are discussed. The nature of the spectral signatures of gases is dealt with, and principles of quantitative gas-constituent observation are detailed. Observation techniques include emission measurement, absorption in reflected and scattered sunlight, and occultation and application of artificial sources. Detection of the following gaseous components is discussed: carbon dioxide, water, ozone and oxidants, carbon monoxide, nitrogen compounds, sulfur compounds, alkyl free radicals, and hydrocarbons and their oxidized derivatives. ESRO

N74-33350 Science Research Council, Slough (England).

THE NEUTRAL AND ION CHEMISTRY OF THE MESOSPHERE AND THERMOSPHERE **c13**

Lance Thomas *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 25 p refs (For availability see N74-33347 22-31)

The chemistry of the mesosphere and the thermosphere is discussed. Interaction of solar radiations with atmospheric gases is dealt with. The neutral composition of mesosphere and thermosphere is discussed. The ion composition, including production and loss of ionization, ion chemistry of E, F1 and F2 region, and presence of negative ions, is described. ESRO

N74-33351 Oxford Univ. (England). Dept. of Physics.

REMOTE SOUNDING. INTRODUCTION **c13**

J. T. Houghton *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 15 p refs (For availability see N74-33347 22-31)

Remote sounding of the earth atmosphere is discussed. Visible and infrared imagery is briefly dealt with and a formula for the atmosphere's radiation budget is given. Sounding of the global atmospheric temperature field is dealt with in detail. ESRO

N74-33352 Ludwig-Maximilians-Universitat, Munich (West Germany). Inst. fuer Meteorologie.

RESEARCH AND DATA REQUIREMENTS FOR CLIMATE STUDIES **c20**

Hans-Juergen Bolle *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 34 p refs (For availability see N74-33347 22-31)

Requirements for studying climates, one of the objectives of the Global Atmospheric Research Program, are discussed. The construction and the working of a climate model are dealt with and main results of model computations are presented. Future needs for climate monitoring and parameterization are discussed and system considerations are given. ESRO

N74-33353 Science Research Council, Slough (England).

LASER SOUNDING EXPERIMENTS **c13**

L. Thomas *In* ESRO The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 25 p refs (For availability see N74-33347 22-31)

The use of laser radar for determination of atmospheric structure and composition is discussed. Laser radar principles are laid down and types of scattering processes are dealt with. A threshold condition for laser action is discussed and atmospheric transmission is dealt with. Several types of atmospheric investigation with laser sounding experiments are indicated, both for regions above and for regions below 40-50 km. ESRO

N74-33354 European Space Research Organization, Paris (France).

REPORT ON DISCUSSIONS ON SPACELAB PAYLOADS FOR ATMOSPHERIC RESEARCH **c13**

In its The Implications for European Space Programmes of the Possibilities of Manned Missions, 3 1973 17 p (For availability see N74-33347 22-31)

The use of spacelab for atmospheric research was presented by scientists from different disciplines. Discussions on their viewpoints are detailed. ESRO

N74-33355# Laboratoire Central de Telecommunications, Paris (France).

FEASIBILITY STUDY OF AN UPSTREAM LINK AT 30 GHz FOR A DIRECT TELEVISION DISTRIBUTION SATELLITE Final Report [ETUDE DE FAISABILITE D'UNE LIAISON MONTANTE A 30 GHz POUR UN SATELLITE DE DIFFUSION DIRECTE DE TELEVISION]

15 Feb. 1974 172 p refs In FRENCH

(Contract ESRO-SC/573-HQ)

(PL-603.355; ESRO-CR(P)-413) Avail: NTIS HC $11.75

A television system for direct broadcast using a geostationary satellite is presented. The recommended up link uses frequency modulation at 30 GHz and makes use of some ten earth stations emitting into one of the four available satellite channels. Wave propagation problems are detailed together with the power budget. The satellite receiver and ground station are discussed with regard to economics and reliability. Alternative configurations are reviewed with an assessment of the merits for the recommended one. A program for technological development is outlined. ESRO

N74-33356# Royal Aircraft Establishment, Bedford (England).
SPACE VEHICLES LAUNCHED DURING 1973
J. A. Pilkington (Scarborough Planetarium) 3 Jan. 1974 10 p (RAE-TM-SPACE-205; BR39758) Avail: NTIS HC $4.00

A compilation is presented of all spacecraft launched between March 1972 and February 1974, regardless of affiliated country. The report provides an update to a previous cumulative listing. The spacecrafts are grouped according to the following orbital schemes: (1) heliocentric orbits; (2) orbits in the earth-moon system; (3) selenocentric orbits, earth launch; and (4) aerocentric orbits, earth launch. The data reflect launch dates, mass and basic shape, basic size, perihelion aphelion, eccentricity, inclination to ecliptic, and pertinent remarks for each spacecraft listed.
ESRO

N74-33357# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
PRELIMINARY CREEP DEFLECTION DESIGN METHOD OF RADIATIVE METALLIC HEAT SHIELDS FOR ADVANCED AF VEHICLES Final Report
Werner R. Jansen Dec. 1973 72 p refs
(AF Proj. 1368)
(AD-781756; AFFDL-TM-73-161-FBS) Avail: NTIS CSCL 22/2

In support of their eventual AF development and use, an analytical investigation of the relative structural efficiency of radiative, coated and uncoated metallic heat shields for long life operation was conducted. The parameters required to establish qualitative performance characteristics for design of reusable heat shields were determined. An optimum weight prediction method was proposed based on the criterion of allowable aero-limited deflection as a direct effect of cyclic creep elongation of the material. Requirements at various temperature exposures were checked against the potential of existing different high temperature alloys on both a strength-to-weight and stiffness-to-weight competitive basis. The feasibility of the mathematical model developed for creep deflection evaluation of different heat shield configurations was partly proven by comparing estimated results and published test data of structural performance. (Modified author abstract) GRA

N74-32501* Kanner (Leo) Associates, Redwood City, Calif.
SPACECRAFT
K. P. Feoktistov *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 2-16 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 216-228 (For availability see N74-32500 22-04)
CSCL 22B

N74-32512* Kanner (Leo) Associates, Redwood City, Calif.
SPACECRAFT OF THE FUTURE
K. A. Gilzin *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 135-153 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 327-338 (For availability see N74-32500 22-04)
CSCL 22B

N74-32514* Kanner (Leo) Associates, Redwood City, Calif.
ARCHITECTURE IN OUTER SPACE
G. I. Pokrovskiy *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 161-169 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 345-349 (For availability see N74-32500 22-04)
CSCL 22B

N74-33411 Joint Publications Research Service, Arlington, Va.
MANNED SPACE STATIONS IN CIRCUMTERRESTRIAL ORBITS
A. I. Rudev and V. G. Emin *In its* Legal Aspects of Manned Spaceflight and Remote Sensing of the Environment (JPRS-61614) 26 Apr. 1974 p 1-10 refs Transl. into ENGLISH from Sov. Gosudarstvo Pravo (Moscow), no. 4, 1972 p 111-115 (For availability see N74-33410 22-34)

N74-33412 Joint Publications Research Service, Arlington, Va.
ENVIRONMENTAL STUDIES FROM SPACE
V. S. Vereshchetin *In its* Legal Aspects of Manned Spaceflight and Remote Sensing of the Environment (JPRS-61614) 26 Apr. 1974 p 11-19 refs Transl. into ENGLISH from Sov. Gosudarstvo Pravo (Moscow), no. 1, 1972 p 121-124 (For availability see N74-33410 22-34)

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N74-33358 Engineering Sciences Data Unit, London (England).
THE FATIGUE STRENGTH AT HIGH ENDURANCE OF NOTCHED LOW ALLOY STEEL SPECIMENS (IN BENDING AND UNDER AXIAL LOADING, ZERO MEAN STRESS)
Jul. 1974 7 p refs Sponsored by Roy. Aeron. Soc. and the Institution of Mech. Engr.
(ESDU-74016) Copyright. Avail: Issuing Activity CSCL 20K

Data on the fatigue strength of notched wrought low alloy steel specimens under constant amplitude loading are presented. The results of tests on specimens containing different types of stress raisers are provided. The data are presented according to whether the specimens are loaded axially or in bending and are plotted in graph form. Each of the data points represents a fatigue strength at high endurance or a fatigue limit obtained from tests on a series of identical specimens.
Author

N74-33359*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SOME CABLE SUSPENSION SYSTEMS AND THEIR EFFECTS ON THE FLEXURAL FREQUENCIES OF SLENDER AEROSPACE STRUCTURES
Robert W. Herr Washington Sep. 1974 39 p refs
(NASA-TN-D-7693; L-9178) Avail: NTIS HC $3.25 CSCL 20K

The effects of several cable suspension configurations on the first free-free flexural frequency of uniform beams have been determined by experiment and analysis. The results of this study confirm that in general the larger the test vehicle the larger is the flexural frequency measurement error attributable to a given cable suspension configuration. For horizontally oriented beams representing modern aerospace vehicles of average size and flexibility, the restraining effects of all but the shortest support cables were minor. The restraining effects of support cables of moderate length attached near the base of vertically oriented vehicles were overshadowed by the effects of beam compression due to gravity.
Author

N74-33360*# Georgia Inst. of Tech., Atlanta.
RESEARCH ON THE ELASTIC STABILITY OF LARGE SHELLS Semiannual Progress Report
Wilfred H. Horton 13 Sep. 1974 18 p
(Grant NGR-11-002-096)
(NASA-CR-139665; SAPR-6) Avail: NTIS HC $4.00 CSCL 20K

Tests were conducted to determine the elastic stability of large shell structures. The configuration of the shells and the instrumentation used in the measurements are described. The testing procedures are explained. Results of the stress analysis are plotted in polar graph form to show the areas of strain in micro inches at the outer surface of the skin and the inner lip of the stringer.
Author

N74-33361*# Beech Aircraft Corp., Boulder, Colo.
DESIGN MANUAL: OXYGEN THERMAL TEST ARTICLE (OTTA) Final Report
W. L. Chronic, C. L. Baese, and R. L. Conder 15 Jun. 1974 93 p
(Contract NAS9-10348)
(NASA-CR-140209; ER15961) Avail: NTIS HC $7.75 CSCL 21I

The characteristics of a cryogenic tank for storing liquid hydrogen, nitrogen, oxygen, methane, or helium for an extended period of time with minimum losses are discussed. A descrip-

tion of the tank and control module, assembly drawings and details of major subassemblies, specific requirements controlling development of the system, thermal concept considerations, thermal analysis methods, and a record of test results are provided. The oxygen thermal test article thermal protection system has proven that the insulation system for cryogenic vessels is effective. Author

N74-33362*# Kanner (Leo) Associates, Redwood City, Calif.
SUPERSONIC FLUTTER OF PLANE, RECTANGULAR, ANISOTROPIC HETEROGENEOUS STRUCTURES
L. Librescu and Tr. Badoiu Washington NASA Aug. 1974 23 p refs Transl. into ENGLISH from Stud. Cercet. Mec. Apl. (Romania), v. 31, no. 2, 1974 p 235-250
(Contract NASw-2481)
(NASA-TT-F-15890) Avail: NTIS HC $4.25 CSCL 20K

Analytical study of the problem of linear flutter of plane thin panels constructed symmetrically from an odd number of anisotropic layers. The supersonic gas flow in which the structure is placed is assumed to be coplanar and of arbitrary direction. After deriving the flutter equations, a criterion is presented for obtaining the critical flutter characteristics, and conclusions are drawn concerning the effect of various parameters taken into consideration. Author

N74-33363# Institut Franco-Allemand de Recherches, St. Louis (France).
DEFORMATION ANALYSIS OF A MATERIAL UNDER PROJECTILE IMPACT Final Report [ANALYSE DES DEFORMATIONS D'UN MATERIAU SOUS L'IMPACT D'UN PROJECTILE]
F. Albe, H. Fagot, and P. Smigielski 7 Jan. 1974 45 p refs In FRENCH
(Contract DRME-73/075)
(ISL-1/74) Avail: NTIS HC $5.25

Under the influence of a projectile impact a ceramic plate deforms and ruptures. The backside of the plate was recorded using double exposure holography with a q switched ruby laser. The first exposure took place before impact, the second exposure after impact but before rupture. Reconstruction of the holograms gave interference patterns which characterize the deformation of the place inbetween the two exposures. Several tests were carried out in which the time between the impact and the second exposure was varied, the average impact speed being 175 m/s or 750 m/s. Evaluation of the holograms permitted calculation of the deformation adn the deformation speed in every point of the sample surface. ESRO

N74-33364# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
THEORETICAL AND EXPERIMENTAL ANALYSIS OF ELASTOPLASTIC DEFORMATION IN A UNIAXIALLY LOADED STRIP OF 2024 T3 ROLLED SHEET MATERIAL WEAKENED BY A CENTRAL ROUND HOLE
A. U. DeKoning Jan. 1973 52 p refs Sponsored by the Neth. Agency for Aerospace Programs Prepared in cooperation with Tech. Hogeschool Twente
(NLR-TR-73011-U) Avail: NTIS HC $5.75

Strain and displacement measurements for a uniaxially loaded strip with a central round hole are described. The experiments were carried out in the elastoplastic domain of the material. Strains and displacements were measured with use of strain gauges and inductive displacement transducers respectively. The test data presented were compared with results of a TRIM6 finite element calculation. The computer program is based on the displacement method. Plasticity effects are described by a series fraction model. Uniaxial stress-plastic strain relations of the actual 2024 T3 unclad aluminium alloy are presented as well as the anisotropy factors. Author (ESRO)

N74-33365# Army Foreign Science and Technology Center, Charlottesville, Va.
PROPAGATION OF SHORT WAVES IN A CYLINDRICAL SHELL
E. B. Ometsinskaya 21 Feb. 1974 10 p refs Transl. into ENGLISH from Prikl. Mekhan. (USSR), v. 6, no. 10, 1970
(AD-781158; FSTC-HT-23-404-72) Avail: NTIS CSCL 20/11

The paper discusses research on the applicability of nonclassical equations of the dynamics of a cylindrical shell, obtained by use of the exponential series method, to the study of short-wave processes in a shell. Shell theory equations are given. Author (GRA)

N74-33366# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE CONFLUENCE OF TWO COLLINEAR GRIFFITH CRACKS
R. P. Srivastav May 1974 11 p refs
(Contract DA-31-124-ARO(D)-462)
(AD-780601; MRC-TSR-1432) Avail: NTIS CSCL 20/12

The solution of the mixed boundary value problem for two collinear Griffith cracks is examined to determine the behavior of the elastic field as the adjacent ends of the cracks come closer. It is shown that the solution for the single crack is not the proper limit of the title problem. Author (GRA)

N74-33367# Ballistic Research Labs., Aberdeen Proving Ground, Md.
REFLECTION OF WEAK SHOCK WAVES IN ELASTIC SOLIDS
Thomas W. Wright Apr. 1974 44 p refs
(AD-780736; BRL-1711) Avail: NTIS CSCL 20/12

The general theory of shock reflections in simple elastic materials leads to a set of implicit functions, obtained from boundary conditions, that must be satisfied identically by the amplitude parameters of the incident and reflected waves. In principal, inversion of the boundary conditions leads to expressions for the reflection parameters as functions of the incident parameter. In practice, even numerical inversion appears to be a formidable task, and complete analytical inversion is generally impossible. For weak shocks, the reflections may be computed in powers of the incident amplitude. A formal scheme for solution of the weak shock case is developed in the report. (Modified author abstract) GRA

N74-33368# California Univ., Berkeley. Structural Engineering Lab.
STATIC AND DYNAMIC GEOMETIRC AND MATERIAL NONLINEAR ANALYSIS
Klaus-Jurgen Bathe, Haluk Ozdemir, and Edward L. Wilson Feb. 1973 190 p refs
(PB-231113/2; UCSESM-74-4) Avail: NTIS HC $5.50 CSCL 20K

The purpose of the report is to present the theory and implementation of the analysis procedures that have been tested and are currently used in the general linear and nonlinear, static and dynamic finite element analysis program NONSAP. First, the continuum mechanics formulations employed are briefly summarized. For finite element discretization, one-, two-, and three-dimensional isoparametric elements have been implemented. The two-, and three-dimensional elements can have variable number of nodes. Next, the various linear and nonlinear material models available in the program to represent elastic, hyperelastic (rubber) and hypoelastic (elastic-plastic) material behavior are presented. Finally, a selected number of sample analyses are described to show some of the current solution capabilities of the program. Author (GRA)

N74-33369# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
ANALYSIS OF THE BUCKLING PRESSURE OF AN ELASTIC PLATE FLOATING ON WATER AND STRESSED UNIFORMLY ALONG THE PERIPHERY OF AN INTERNAL HOLE Final Report 1 Jul. 1972 - 31 May 1974
Shunsuke Takagi Mar. 1974 48 p refs
(AD-780972; AROD-I-466-2-E) Avail: NTIS CSCL 20/11

The problem reduces to an eigenvalue problem of a fourth-order ordinary differential equation in a semi-infinite region. Two methods of solution, the Green function method and the contour integral method, are presented. The Green function method yields an integral equation that can be solved only numerically. The contour integral method gives a third-order ordinary differential equation of which the singular points are all regular. A series solution relative to a singular point can be analytically continued to a linear combination of a set of series solutions relative to another singular point, in order to find the integrand,

required in the contour integral method, that vanishes at x = infinity and has a branch point at the lower end of the integration. The contour integral formulated is reduced to a linear combination of the fundamental solutions, relative to x = 0, of the original fourth-order differential equation. This linear combination can give the solutions to our eigenvalue problem. Author (GRA)

N74-33370# Naval Ordnance Lab., White Oak, Md.
HIGH-FIELD MAGNETIZATION AND COERCIVITY OF AMORPHOUS RARE-EARTH Fe2 ALLOYS
Arthur E. Clark 11 Jul. 1973 12 p refs
(R0220601)
(AD-779858; NOLTR-74-47) Avail: NTIS CSCL 20/12

High-field magnetization studies were made from 4K to room temperature on rapidly sputtered TbFe2, DyFe2, and SmFe2. At 4.2K the magnetic moment resembles that of polycrystal samples, whereas at room temperature it is substantially lower. Huge coercive forces (20-30 kOe) were observed at 4.2K. Partial crystallization of TbFe2 from the sputtered amorphous state yields high-energy products and coercivities (=3 kOe) at room temperature. Author (GRA)

N74-33371# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
APPROXIMATE SOLUTIONS FOR THE FUNDAMENTAL FREQUENCY OF SQUARE PLATES WITH VARIABLE THICKNESS M.S. Thesis
Faust H. Wertz Mar. 1974 81 p refs
(AD-780634; GAW/MC/74-20) Avail: NTIS CSCL 20/11

A perturbation method was used to approximate the fundamental frequency and mode shape of variable thickness, square, simply supported plates. The study was divided into two major phases; development of the necessary equations from perturbation theory and application of the equations to specific examples. The perturbation equations developed were found to be quite general, since the frequency of a plate of any thickness shape could be evaluated without reformulation of the equations in a different form. The only requirement necessary to use the equations is that the thickness of the plate be representable as a continuous function with continuous first derivatives. (Modified author abstract) GRA

N74-33372# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ISO-DAMAGE CURVES FOR PLATES UNDER BLAST LOADING M.S. Thesis
Philip B. Aitken-Cade Mar. 1974 59 p refs
(AD-780624; FAW/MC/74-1) Avail: NTIS CSCL 19/4

The report presents a development of iso-damage curves for a fixed edge square membrane, a simply supported circular plate, a clamped circular plate, a simply supported square plate, and a clamped square plate. The blast loading of the membrane is idealized two ways; first as a rectangular pressure pulse and secondly as an exponentially decaying pressure pulse. The blast loading on the plates is idealized as a rectangular pressure pulse. The membrane is assumed to behave like rigid-plastic material that will not deform until the yield stress is reached. Expressions are obtained for the final deflection of the membrane and by the judicious choice of dimensionless variables, a single iso-damage curve is developed. (Modified author abstract) GRA

N74-33373# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
THE EFFECT OF GEOMETRIC NONLINEARITIES ON THE CREEP BUCKLING OF AXIALLY COMPRESSED CIRCULAR CYLINDRICAL SHELLS
Nicholas J. Hoff Apr. 1974 9 p refs
(Contract N00014-67-A-0112-0003; NR Proj. 064-125)
(AD-781329; SUDAAR-476; TR-29) Avail: NTIS CSCL 20/11

A correction is given to the small-displacement theory of the axisymmetric creep buckling of axially compressed circular cylindrical shells. The correction takes into account the possibility of a non-axisymmetric elastic snap through in agreement with Koiter's theory after a sufficient amount of axisymmetric permanent deformation has developed in consequence of creep. Author (GRA)

N74-33374# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
A USER'S MANUAL FOR THE SEQUENCE ACCOUNTABLE FATIGUE ANALYSIS COMPUTER PROGRAM Final Report, 1 Oct. 1972 - 1 May 1973
J. M. Potter and R. A. Noble May 1974 67 p refs
(AF Proj. 1347)
(AD-781379; AFFDL-TR-74-23) Avail: NTIS CSCL 20/11

The report presents a detailed description of a computer program to calculate cumulative damage of notched structural members subjected to arbitrary spectra. The Sequence Accountable Fatigue Analysis computer program develops its sequence sensitivity by tracking residual stresses local to a notch throughout the spectrum of loads. Residual stress relaxation analysis is included to increase the generality of the results. An example spectrum and resulting cumulative damage analysis are illustrated. Author (GRA)

N74-33375# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
CREEP STRAIN IN THE VICINITY OF A SIMULATED FASTENER
D. G. Berghaus Dec. 1973 51 p refs
(Contract N00014-67-A-0112-0003; NR Proj. 064-425)
(AD-781328; SUDAAR-475) Avail: NTIS CSCL 13/13

The report describes methods devised to determine creep strain in an aluminum plate specimen in the region near a fastener through which load is transmitted to the plate. Techniques are given to determine creep strains alone without the added effects of elastic deformation and thermal strains. The techniques are applied to a test specimen and the results indicate strains are much lower than expected from simple tensile test results. Author (GRA)

N74-33376# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
A STUDY OF LINEAR VERY NEAR AND FAR FIELD EFFECTS IN PHOTOELASTIC STRESS INTENSITY DETERMINATION
M. A. Schroedl (Firestone Central Res. Lab.) and C. W. Smith Jul. 1974 48 p refs
(Contract DAAF07-69-C-0444)
(AD-781543; VPI-E-74-13) Avail: NTIS CSCL 20/12

A technique known as the Taylor Series Correction Method (TSCM) for extracting the stress intensity factor from photoelastic data is reviewed. The need for artificial flaws is identified and an approach due to Savin is used to evaluate the near field effects of various practical flaw shapes upon the apparent stress intensity factor. Using the Sneddon-Srivastav solution for a line crack in a finite width plate, the constriction of the singular zone is demonstrated as the crack tip approaches the free edge. Results indicate that care must be taken in applying TSCM to obtain photoelastic data at appropriate distances from the crack tip. Author (GRA)

N74-33377# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
DYNAMIC RESPONSE OF PLATES AND CYLINDRICAL SHELLS TO MOVING MASSES
R. P. McNitt and R. Raghavan (Foster and Wheeler Corp.) Jun. 1974 91 p refs
(Contract DAAF07-69-C-0444)
(AD-781542; VPI-E-74-14) Avail: NTIS CSCL 20/11

The dynamic responses of plates and cylindrical shells to a moving mass are presented. The mass may move harmonically along and/or perpendicularly to the plate or shell. Solutions are obtained by a finite integral transform on space followed by the application of a stable finite difference technique on time. It is shown that the accelerations (centrifugal and Corolis) induced by beam curvature may play an important role in the dynamic responses. Author (GRA)

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N74-33378* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
REMOTE FIRE STACK IGNITER Patent
William L. Ray, inventor (to NASA) Issued 3 Sep. 1974 6 p Filed 29 Aug. 1973 Supersedes N73-31826 (11 -22, p 2727)
(NASA-Case-MFS-21675-1; US-Patent-3,833,336; US-Patent-Appl-SN-392823; US-Patent-Class-431-202; US-Patent-Class-23-277C) Avail: US Patent Office CSCL 20M

An igniter is described mounted on a vent stack with an upper, flame cage near the top of the stack to ignite emissions from the stack. The igniter is a tube with a lower, open, flared end having a spark plug near the lower end and a solenoid-controlled valve which supplies propane fuel from a supply tank. Propane from the tank is supplied at the top under control of a second, solenoid-controlled valve. The valve controlling the lower supply is closed after ignition at the flame cage. The igniter is economical, practical, and highly reliable.
Official Gazette of the U.S. Patent Office

N74-33379* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SOLID MEDIUM THERMAL ENGINE Patent
James R. Jedlicka, LeRoy R. Guist, and Richard M. Beam, inventors (to NASA) Issued 20 Aug. 1974 25 p Filed 27 Feb. 1973 Supersedes N73-20931 (11 - 11, p 1347)
(NASA-Case-ARC-10461-1; US-Patent-3,830,060; US-Patent-Appl-SN-336319; US-Patent-Class-60-527) Avail: US Patent Office CSCL 20M

A device is described which uses a single phase metallic working substance to convert thermal energy directly into mechanical energy. The device consists of a cylindrical metal tube which is free to rotate about its axis while being subjected to continuous bending moment stresses along the longitudinal axis of rotation. The stressing causes portions of the tube to be under compression while other parts are under tension which in turn causes the tube to rotate and provide mechanical energy.
P.N.F.

N74-33380 Ernst-Mach-Inst., Freiburg (West Germany).
DEFLAGRATION TO DETONATION TRANSITION
E. Schmolinske Mar. 1974 88 p refs In GERMAN; ENGLISH summary
(Rept-2/74) Avail: Issuing Activity

The transition from deflagration to detonation was demonstrated experimentally in pipes, in which wall turbulence effects were eliminated by using spherical deflagration and detonation waves. This arrangement was adapted to the theoretical conception which is taken as a basis for Hugoniot adiabatics, so that the transition, as representable by Hugoniot curves, can be demonstrated experimentally. Three cases are distinguished for two spherical deflagration waves forming a Mach stem while intersecting. The transition from deflagration to detonation, and the accompanying instabilities, can be seen on simultaneously-taken smoke film records and schlieren photographs. ESRO

N74-33381# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
LOW-INERTIA REGENERATORS
Y. Goldman [1966] 16 p refs
(TAE-200) Avail: NTIS HC $4.00

A thermal analysis of a low-inertia regenerator (heat exchanger) of the metal pebble-bed type is presented, including a mathematical model and a method for determining the temperatures of the gas and pebble bed. An evaluation of the proposed method, a numerical example, and basic design details, are given. Author

N74-33382*# Tulane Univ., New Orleans, La. Dept. of Mechanical Engineering.
EXPERIMENTAL DETERMINATION OF TURBULENCE IN A GH2-GOX ROCKET COMBUSTION CHAMBER
P. Tou, R. Russell, and J. Ohara Aug. 1974 46 p refs
(Grant NGR-19-002-030)
(NASA-CR-134672) Avail: NTIS HC $5.50 CSCL 21B

The intensity of turbulence and the Lagrangian correlation coefficient for a gaseous rocket combustion chamber have been determined from the experimental measurements of the tracer gas diffusion. A combination of Taylor's turbulent diffusion theory and Spalding's numerical method for solving the conservation equations of fluid mechanics was used to calculate these quantities. Taylor's theory was extended to consider the inhomogeneity of the turbulence field in the axial direction of the combustion chamber. An exponential function was used to represent the Lagrangian correlation coefficient. The results indicate that the maximum value of the intensity of turbulence is about 15% and the Lagrangian correlation coefficient drops to about 0.12 in one inch of the chamber length. Author

N74-33383# Imperial Coll. of Science and Technology, London (England).
SOME VALIDATION WORK ON THE EDDY BREAK-UP MODEL FOR TURBULENT PERMIXED FLAMES
F. C. Lockwood and H. B. Mason Feb. 1974 25 p
(HTS/74/7; Lecture-10) Avail: NTIS HC $4.25

The prediction of the flame spread through a turbulent premixed flow downstream of a baffle stabilizer was investigated towards validation of the Eddy break-up model. A boundary layer calculation procedure was used to predict the present baffle-stabilized flames. Test data are shown which indicate that the different flame spreads observed during experimentation are not attributable to approach velocity, approach turbulence, intensity, and blockage, but the differing characteristics of the recirculation zones. A.A.D.

N74-33384*# Rocketdyne, Canoga Park, Calif.
LIQUID ROCKET COMBUSTION COMPUTER MODEL WITH DISTRIBUTED ENERGY RELEASE. DER COMPUTER PROGRAM DOCUMENTATION AND USER'S GUIDE, VOLUME 1
L. P. Combs 1 Jan. 1974 107 p refs Revised Prepared for JPL
(Contract NAS7-746)
(NASA-CR-140026) Avail: NTIS HC $8.50 CSCL 21B

A computer program for analyzing rocket engine performance was developed. The program is concerned with the formation, distribution, flow, and combustion of liquid sprays and combustion product gases in conventional rocket combustion chambers. The capabilities of the program to determine the combustion characteristics of the rocket engine are described. Sample data code sheets show the correct sequence and formats for variable values and include notes concerning options to bypass the input of certain data. A seperate list defines the variables and indicates their required dimensions. Author

N74-33385# Sandia Labs., Albuquerque, N.Mex.
RADIAL AND CIRCUMFERENTIAL EQUILIBRATION OF A RADIANT ENERGY PULSE IN A CYLINDRICAL COMPOSITE
W. P. Schimmel, Jr. 1973 11 p refs Presented at the 13th Intern. Conf. on Thermal Conductivity, Lake Ozark, Mo.
(SLA-74-5230; Conf-731106-5) Avail: NTIS HC $4.00

An analytical solution was obtained for the transient temperature distribution in a multi-layered medium consisting of several concentric right-circular cylinders. Since the solution is exact in the mathematical sense, it is free from some of the shortcomings of numerical techniques. For example, having once determined the radial and circumferential eigenvalues for a particular problem, it is possible to evaluate the temperature at a particular position in the composite and at a particular time without solving for the temperature field at all previous times.
Author (NSA)

N74-33386# European Space Research Organization, Paris (France).
DETERMINATION OF THE CORE AND BOUNDARIES OF

HOT FREE JETS USING HIGH-SPEED PHOTOGRAPHY
Rudolf Ferdinand Neubauer et al Jun. 1974 34 p refs Transl. into ENGLISH of Bestimmung des Kerns u. der Strahlgrenzen bei Heissen Freistrahlen mit Hilfe der Kurzzeitfotografie, DLR-FB-73-89, DFVLR, 4 Jul. 1973
(ESRO-TT-69; DLR-FB-73-89) Avail: NTIS HC $4.75; DFVLR, Porz, West Ger. 11.50 DM

An electric arc was used for generating nitrogen hot jets and nitrogen-propane flames. The core, about four nozzle diameters long, shows a high velocity of core length changing. The radius of the jet grows linearly with its length. An additional widening of the nitrogen hot jet and of the nitrogen-propane-flame starts at a length of 40 nozzle diameters. This effect is also observed at an argon hot jet and an argon-propane-flame. The cameras used, a Hitachi slow-motion and a rotating mirror camera, are described. The method for determining zones with equal light intensity, using equidensity measurements, is outlined.
ESRO

N74-33387# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ANALYSIS OF THE THERMAL RESPONSE OF A HYDROCARBON FUEL WHEN SUBJECTED TO A HIGH INTENSITY LASER M.S. Thesis
Robert J. Skaar Mar. 1974 93 p refs
(AD-780633; GAW/MC/74-9) Avail: NTIS CSCL 21/2

An investigation was performed on laser-fuel interactions. The investigation included an analysis of laser ignition modes, ignition criteria, and the laser requirements for vapor ignition. The modes investigated were the wall heating mode for heating due to heat transfer from a laser irradiated plate and the direct heating mode for heating due to direct laser impingment on the fuel vapor. A computer programed mathematical model for one-dimensional heat transfer was used to determine the thermal response in a metal plate backed by liquid fuel or fuel vapor, and the fluid heating rate. Aluminum and titanium were considered. The investigation shows that in general, the laser has the capability of causing fuel fire or explosion. (Modified author abstract)
GRA

N74-33388# Bureau of Mines, Pittsburgh, Pa. Mining and Safety Research Center.
CONSTANT-VOLUME FLAME PROPAGATION
H. E. Perlee and C. H. Saul Mar. 1974 29 p
(PB-231287/4; BM-RI-7839) Avail: NTIS HC $3.25 CSCL 21B

Mathematical expressions are derived for the histories of the pressure flame radius, mass fraction burned, and burned and unburned gas temperatures associated with a spherical flame propagating concentrically in a spherical vessel. The equations are solved numerically for a 9.5 pct CH41 air mixture using the best available information for the burning velocity, expansion ratio, and specific heat ratio. Calculated histories are incomplete accord with experimental measurements. It was further established that the usual assumption of constant specific heat ratio is unacceptable, but equating the burned and unburned specific heat ratios result in no apparent error in the histories. The cubic law is derived and discussed, and it is found that the law is valid only during the early period of flame growth. (Modified author abstract)
GRA

N74-33389# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOME FLAME STABILIZATION PROBLEMS
A. M. Levin 23 Apr. 1974 17 p refs Transl. into ENGLISH from Teor. Prakt. Szhiganiya gaza (USSR), no. 5, 1972 p 59-68
(AD-779808; FTD-HT-23-871-74) Avail: NTIS CSCL 21/2

The characteristics of combustion stability with respect to flash-back and flame separation in gas burner devices are discussed. The theory of critical velocity gradients is expanded to show the influence of a number of external factors on combustion stability. An analysis of the flame structure in a Bunsen burner is presented. Mathematical models are developed to support the theoretical concepts. Diagrams of the flow system are provided.
Author

N74-33390# Israel Program for Scientific Translations, Ltd., Jerusalem.
THERMODYNAMIC AND THERMOPHYSICAL PROPERTIES OF COMBUSTION PRODUCTS. VOLUME 1: COMPUTATION METHODS
V. P. Glushko, ed., V. E. Alemasov, A. F. Dregalin, A. P. Tishin, and V. A. Khudyakov 1974 454 p refs Transl. into ENGLISH of the book "Termodinamicheskie i Teplofizicheskie Svoistva Produktov Sgoraniya. Metody Rascheta" Moscow, VINITI, 1971 454 p Sponsored by the US-Israel Binatl. Sci. Found.
(TT-74-50019-Vol-1) Avail: NTIS HC $25.75

A handbook on the combustion products of high energy propellants used in different branches of thermal power production, chemistry, or engine design is presented. The most general properties of the propellants and the products of combustion are examined. The methods for preparing the initial data on propellants for calculating the thermodynamic and thermophysical properties of the combustion products are explained. Methods for calculating the equilibrium composition of combustion products, the characteristics of the processes of combustion and expansion, and methods of extrapolation and interpolation of the results are developed. An analysis of the properties of real systems of combustion products and of the influence of these properties on the basic characteristics of the systems is included.
Author

N74-33391# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATING HETEROGENEOUS IGNITION OF PARTICLE AGGREGATES
M. A. Gurevich, G. E. Ozerova, and A. M. Stenanov 18 Jun. 1974 20 p refs Transl. into ENGLISH from Fiz. Goreniya Vzryva (USSR), v. 7, no. 4, Dec. 1971 p 518-527
(AD-781654; FTD-HT-23-1218-74) Avail: NTIS CSCL 21/2

This paper presents calculations to determine the relation between ignition delay time in a gas suspension of a uniformly reacting fuel and different initial process parameters. In the case of an aggregate of uniformly reacting particles the amount of gas oxidizer and solid fuel burned up will affect the heat and mass exchange processes differently.
GRA

N74-33392# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HIGH-PRESSURE ACOUSTIC GAS BURNERS
N. V. Lavrov, E. I. Rozenfeld, Yu. Ya. Borisov, Yu. A. Zhebrak, and V. G. Smolenskii 17 Jun. 1974 16 p refs Transl. into ENGLISH from Teor. Prakt. Szhiganiya Gaza (USSR), v. 5, 1972 p 223-232
(AD-781652; FTD-HT-23-878-74) Avail: NTIS CSCL 21/2

The basic design features of ultrasonic gas-jet radiators and acoustic burners are discussed. The aerodynamic and thermal engineering characteristics are stressed. The scheme of the acoustic injection burner is illustrated. An aerodynamic diagram of the directivity of the acoustic burner with an adjustable flame length is provided.
Author

N74-33393# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL INVESTIGATION OF FRICTION AND HEAT EMISSION ON A LONG CYLINDER WITH AN OGIVAL NOSE AT MACH 3.51 AND 6.96
V. M. Kovalenko 18 Jun. 1974 12 p refs Transl. into ENGLISH from Izv. Sib. Otd. Akad. Nauk SSSR, Ser. Tekh. Nauk (USSR), no. 13, 1971 p 22-27
(AD-781630; FTD-HT-23-1282-74) Avail: NTIS CSCL 01/1

Experimental determinations were made of the integral characteristics of the turbulent boundary layer, frictional drag, and heat emission at high supersonic velocities. Experiments were carried out in a hypersonic wind tunnel on a long hollow body of revolution with an ogival nose having total elongation.
Author (GRA)

N74-33394# Cranfield Inst. of Technology (England). School of Mechanical Engineering.
AIDED COMBUSTION OF LIQUID AND GASEOUS FUELS INJECTED TRANSVERSELY INTO A SUPERSONIC AIRSTREAM Final Report, 1 Jul. 1972 - 30 Jun. 1973
Roy A. Cookson Mar. 1974 41 p refs

(Grant AF-AFOSR-2321-72)
(AD-780615; ARL-74-0098) Avail: NTIS CSCL 21/2

An investigation has been made of the sustained combustion of transversely injected fuel jets in an enclosed Mach 2 air-stream. Hydrogen, methane and kerosene were employed as fuels. High-enthalpy test-air was supplied from a pebble-bed regenerative heat exchanger through a Mach 2 two-dimensional nozzle. The stagnation temperature of the test-air could be varied within wide limits, but for the studies reported here, had a maximum value of about 1800K. The favorable flame stabilization effect of the obstruction caused by a fuel jet injected transversely into the supersonic stream has been demonstrated. Two non-dimensional quantities have been proposed and have been shown to effectively describe the fluid dynamic effects associated with the flame stabilisation process. The two proposed non-dimensional quantities have been used in studying the effect of the interaction between the pilot and the main fuel injection configurations. (Modified author abstract) GRA

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N74-33395*# General Electric Co., Philadelphia, Pa. Space Div.
STUDY FOR IDENTIFICATION OF BENEFICIAL USES OF SPACE, PHASE 1. VOLUME 2, BOOK 1: TECHNICAL REPORT, INTRODUCTION, METHODOLOGY, RESULTS Final Report
23 Apr. 1973 196 p refs
(Contract NAS8-28179)
(NASA-CR-120283; DIN-73SD4259-Vol-2-Bk-1) Avail: NTIS HC $13.00 CSCL 05A

A study was conducted to determine the beneficial uses of space and to identify the products, processes, or services that will be best developed or produced in the unique environment offered by spacecraft. The subjects discussed are: (1) review of study background, (2) specific users and uses, (3) methodology, and (4) basic data generated and significant results. Author

N74-33396*# General Electric Co., Philadelphia, Pa. Space Div.
STUDY FOR IDENTIFICATION OF BENEFICIAL USES OF SPACE, PHASE 1. VOLUME 2, BOOK 2: TECHNICAL REPORT: RESULTS, CONCLUSIONS AND RECOMMENDATIONS Final Report
23 Apr. 1973 152 p refs
(Contract NAS8-28179)
(NASA-CR-120284; Rept-73SD4259) Avail: NTIS HC $10.75 CSCL 05A

A variety of technologies were investigated to determine the benefits to be derived from space activities. The subjects accepted for product development are: (1) eutectics for cold cathodes, (2) higher putiry fiber optics, (3) fluidic wafers, (4) large germanium wafers for gamma ray camera, (5) improved batteries and capacitors, (6) optical filters, (7) corrosion resistant electrodes, (8) high strength carbon-based filaments for plastic reinforcement, and (9) new antibiotics. In addition, three ideas for services, involving disposal of radioactive wastes, blood analysis, and enhanced solar insolation were proposed. Author

N74-33397*# Stanford Research Inst., Menlo Park, Calif.
TECHNOLOGY TRANSFER-TRANSPORTATION Semiannual Report, 15 Aug. 1973 - 15 Feb. 1974
Tom Anyos, Ruth Lizak, and James Wilhelm Mar. 1974 44 p refs
(Contract NASw-2455; SRI Proj. PYU-2201)
(NASA-CR-140049; SAR-2) Avail: NTIS HC $5.25 CSCL 13F

Problems in the public transportation industry and refining methods for decreasing the time gap between the development and the marketing of new technology are considered. Eight NASA innovations are either being adapted for use on highways, railways, or rapid transit, or are already entering the marketplace. Chronologies for three of these programs are provided. Author

N74-33398*# Denver Research Inst., Colo.
THE NASA ROLE IN MAJOR AREAS OF HUMAN CONCERN: HEALTH CARE
James E. Freeman, James P. Kottenstette, and Jerome J. Rusnak Feb. 1973 18 p refs
(Contract NASw-2362)
(NASA-CR-139656) Avail: NTIS HC $4.00 CSCL 05K

Benefits derived from the civilian aeronautics and space effort are discussed in a statement whose focus is on the developments in health care which can be traced to specific NASA program elements. A summary is provided for each case where NASA has been involved in expanding the biomedical technical base, as well as where NASA has been directly instrumental in providing solutions in maintaining adaquated health, and correcting health problems when they occur. A.A.D.

N74-33399*# General Electric Co., Philadelphia, Pa. Missile and Space Div.
STUDY FOR IDENTIFICATION OF BENEFICIAL USES OF SPACE (BUS), PHASE 2. VOLUME 2: TECHNICAL REPORT. BOOK 2: SECTION 5, APPENDICES A THROUGH D Final Report, Dec. 1972 - Dec. 1973
1 Nov. 1973 78 p refs 3 Vol.
(Contract NAS8-28179)
(NASA-CR-120287; Doc-73SD4281-Vol-2-Bk-2-App) Avail: NTIS HC $7.00 CSCL 05A

An investigation of the technology and programmatics involved in the development of four of the products selected as capable of benefitting from space manufacturing was conducted. The four activities selected are as follows: (1) levitation heating and melting of tungsten, (2) free suspension processing of oxides to form amorphous oxide materials, (3) crystals for surface wave acoustic substrates, and (4) space manufacturing of surface acoustic wave devices. For individual titles, see N74-33400 through N74-33403.

N74-33400* General Electric Co., Philadelphia, Pa.
LEVITATION HEATING AND MELTING OF TUNGSTEN, APPENDIX A c17
Gerald Wouch *In its* Study for Identification of Beneficial Uses of Space (BUS), Phase 2, Vol. 2, Book 2, Sect. 5 1 Nov. 1973 24 p refs (For availability see N74-33399 22-34)
CSCL 11F

The pertinent factors in levitation heating and melting of tungsten are discussed. The benefits to be derived from conducting purification processes in space environments are analyzed. It was determined that the following advantages would be realized: (1) crucibleless heating and melting, (2) vacuum and/or inert gas purification, and (3) control of grain size through supercooling. Author

N74-33401* General Electric Co., Philadelphia, Pa.
FREE SUSPENSION PROCESSING OF OXIDES TO FORM AMORPHOUS OXIDE MATERIALS, APPENDIX B c15
G. Wouch *In its* Study for Identification of Beneficial Uses of Space (BUS), Phase 2, Vol. 2, Book 2, Sect. 5 1 Nov. 1973 24 p refs (For availability see N74-33399 22-34)
CSCL 13H

The processing of yttria, zirconia, and alumina under weightless conditions is discussed. The process consists of levitation or position control, heating and melting, superheating, and supercooling. The use of arc imaging furnaces, lasers, induction heating, microwave, and electron beam methods are analyzed to show the advantages and disadvantages of each. Author

N74-33402* General Electric Co., Philadelphia, Pa.
CRYSTALS FOR SURFACE WAVE ACOUSTIC SUBSTRATES, APPENDIX C c26
Donald R. Ulrich *In its* Study for Identification of Benefical Uses of Space (BUS), Phase 2, Vol. 2, Book 2, Sect. 5 1 Nov. 1973 5 p refs Revised (For availability see N74-33399 22-34)
CSCL 20B

The growth of single crystals in a space environment is discussed. Several crystals which could be beneficially grown in

weightless conditions are identified. For surface wave acoustic applications, the surface perfection and internal crystal perfection which are obtainable in space, are favorably indicated. Author

N74-33403* General Electric Co., Philadelphia, Pa.
SPACE MANUFACTURING OF SURFACE ACOUSTIC WAVE DEVICES, APPENDIX D **c09**
G. Sardella *In its* Study for Identification of Beneficial Uses of Space (BUS), Phase 2, Vol. 2, Book 2, Sect. 5 1 Nov. 1973 20 p refs (For availability see N74-33399 22-34)
CSCL 09E

Space manufacturing of transducers in a vibration free environment is discussed. Fabrication of the masks, and possible manufacturing of the surface acoustic wave components aboard a space laboratory would avoid the inherent ground vibrations and the frequency limitation imposed by a seismic isolator pad. The manufacturing vibration requirements are identified. The concepts of space manufacturing are analyzed. A development program for manufacturing transducers is recommended. Author

N74-33404# Aeronautical Research Labs., Melbourne (Australia).
SCHEDULING AIRCRAFT SORTIES. PART 1: MINIMIZING THE NUMBER OF SCHEDULES WITH A FIXED SCHEDULE LENGTH
P. F. Preston Jan. 1974 14 p refs
(ARL/Sys-39-Pt-1) Avail: NTIS HC $4.00

A problem is considered that arises in scheduling aircraft to perform a given transportation task. Basically the problem is to minimize the number of aircraft days needed to complete a task. It can be formulated as an integer linear programming problem, and it turns out to be identical to a problem called the paper trim problem that has received considerable attention in the operational research literature. An algorithm that finds the optimal integer solution is presented. The algorithm has been programmed in FORTRAN and has been successfully used to solve a variety of problems. Author

N74-33405# Committee on Commerce (U. S. Senate).
OCEAN POLLUTION
Washington GPO 1974 411 p refs Hearings on S. 1067, S. 1070, and S. 1351 before Subcomm. on Oceans and Atmos. of the Comm. on Commerce, 93d Congr., 1st Sess., no. 93-46, 12, 13, and 28 Jun. 1973
(GPO-26-282) Avail: Subcomm. on Oceans and Atmos.

The practices and activities which contribute to ocean pollution were discussed in a Congressional hearing, and included waste heat disposal, industrial effluent discharge, ocean dumping, air pollution, marine mining, energy development, nuclear testing, and radioactive waste disposal. The marine pollutants of greatest concern are identified, along with the total quantities produced which might be expected to reach the environment, the toxicity of the pollutants to marine organisms and to human health, and the degree of persistence of the polluntants in the environment. Recommendations for solving the problem of ocean pollution are advanced, which include federal legislation, international cooperation, and enforcement measures. A.A.D.

N74-33406# Committee on Commerce (U. S. Senate).
THE 1973 IMCO CONFERENCE ON MARINE POLLUTION FROM SHIPS
Washington GPO 1974 180 p refs Hearing before Comm. on Commerce, 93d Congr., 1st Sess., no. 93-52, 14 Nov. 1973
(GPO-26-864) Avail: Comm. on Commerce

A report by the Intergovernmental Maritime Consultive Organization (IMCO) was presented to Congress which outlined the obligations required by the International Convention for the Prevention of Pollution from Ships (1973), and included commentary by a joint group of experts on the scientific aspects of marine pollution. Modern trends in shipping are identified, and a list is supplied of U.S. flag chemical ships (as of December 1, 1973) which have a potential to contribute to accidental pollution of the world's waters. Measures instituted by IMCO for the prevention of accidents to ships are listed, along with methods of dealing with spillages of oil. A hazard profile is also included which assigns values to the degrees of danger to human health and living resources posed by certain selected substances typically found in polluted water. The text of the articles of the International Convention for the Prevention of Pollution from Ships is provided. A.A.D.

N74-33407# Committee on Science and Astronautics (U. S. House).
NASA'S GENERAL AVIATION PROGRAMS
Washington GPO 1974 329 p refs Hearings before Subcomm. on Aeron. and Space Technol. of the Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., no. 36, 14-15 May - 1974
(GPO-37-844) Avail: Subcomm. on Aeron. and Space Technol.

A report is presented from the Subcommittee on aeronautical research and development. The problems of civil and general aviation are reported along with programs that focus on specific problem areas critical to general aviation safety and utility. M.C.F.

N74-33408# Joint Committee on Defense Production (U. S. Congress).
ANNUAL REPORT OF THE ACTIVITIES OF THE JOINT COMMITTEE ON DEFENSE PRODUCTION WITH MATERIAL ON MOBILIZATION FROM DEPARTMENTS AND AGENCIES, PART 2
Washington GPO 7 Feb. 1974 631 p refs Twenty-third Annual Report of the activities of the Joint Comm. on Defense Production, 93d Congr., 1st Sess., 5 Feb. 1974
(S-93-683; GPO-23-827; AR-23) Avail: US Capitol, Senate Document Room

Strategic stockpiling objectives of materials for mobilization are reviewed and other stockpiling operations, including the acquisition of materials from abroad and the disposal of stockpile surplusses, are elaborated. G.G.

N74-33409# National Science Foundation, Washington, D.C.
FEDERAL SUPPORT TO UNIVERSITIES, COLLEGES, AND SELECTED NONPROFIT INSTITUTIONS, FISCAL YEAR 1972 Annual Report, 1972
1974 144 p
(NSF-74-305; AR-5) Avail: SOD HC $2.45

Federal obligations are reported by 14 agencies that account for more than 95% of all federal support to universities and colleges. The report examines science education in terms of three broad areas of support: fellowships, traineeships, and training grants; general support of science; and facilities and equipment for instruction in science and engineering. Also included are data on federal obligations to selected nonprofit institutions, for the support, construction, and operation of research facilities. M.C.F.

N74-33410# Joint Publications Research Service, Arlington, Va.
LEGAL ASPECTS OF MANNED SPACEFLIGHT AND REMOTE SENSING OF THE ENVIRONMENT
26 Apr. 1974 22 p refs Transl. into ENGLISH from Sov. Gosudarstvo Pravo (Moscow), no. 4, 1, 1972 p 111-115, 121-24
(JPRS-61614) Avail: NTIS HC $4.25

An examination of international cooperation and law is presented on manned environmental spaceflight studies. For individual titles, see N74-33411 through N74-33412.

N74-33411 Joint Publications Research Service, Arlington, Va.
MANNED SPACE STATIONS IN CIRCUMTERRESTRIAL ORBITS **c31**
A. I. Rudev and V. G. Emin *In its* Legal Aspects of Manned Spaceflight and Remote Sensing of the Environment (JPRS-61614) 26 Apr. 1974 p 1-10 refs Transl. into ENGLISH from Sov. Gosudarstvo Pravo (Moscow), no. 4, 1972 p 111-115 (For availability see N74-33410 22-34)

Manned space stations are investigated for their usefulness in the fields of astronomy, geography, meteorology, and biology. Classification problems of circumterrestrial manned space stations and international space laws are reported. The problems of space rubbish are reported for spacecraft safety. M.C.F.

N74-33412 Joint Publications Research Service, Arlington, Va.
ENVIRONMENTAL STUDIES FROM SPACE **c31**
V. S. Vereshchetin *In its* Legal Aspects of Manned Spaceflight and Remote Sensing of the Environment (JPRS-61614) 26 Apr.

1974 p 11-19 refs Transl. into ENGLISH from Sov. Gosudarstvo Pravo (Moscow), no. 1, 1972 p 121-124 (For availability see N74-33410 22-34)

The use of space techniques and equipment for studying the natural medium surrounding man is reported. The transmission of systematic information, on the environment of earth, is presented. M.C.F.

N74-33413*# Little (Arthur D.), Inc., Cambridge, Mass.
AN APPROACH TO DEVELOPING THE MARKET FOR SPACE SHUTTLE PAYLOADS: BUSINESS/PUBLIC POLICY ISSUES AND INTERNATIONAL MARKETING CONSIDERATIONS Final Report
William A. W. Krebs 31 Aug. 1974 76 p refs
(Contract NAS8-30739)
(NASA-CR-120420) Avail: NTIS HC $7.00 CSCL 05C

The business and public policies were assessed that were determined to be important for NASA to consider in the design of a program for stimulating use of the space transportation system (STS) among potential users in the U.S. private sector and in foreign countries, in preparation for operations of the space shuttle in the early 1980's. Salient factors related to international cooperation in space are identified for special consideration in the development of user potential of the STS. Author

N74-33414# Booz-Allen Applied Research, Inc., Bethesda, Md.
FORECASTS OF TRANSPACIFIC AIR TRAVEL, 1975, 1980, 1985 Final Report
Michael Jay Roberts Oct. 1973 165 p
(Contract DOT-FA72WA-3147)
(AD-775315; FAA-RD-73-58) Avail: NTIS HC $5.00

The final results are reported of a study of the economic, social, demographic, geographic, political and technological factors which underlie the growth in transpacific air traffic. The study was to develop detailed route segment forecasts of transpacific air traffic to assist the FAA in their assessment of the future need for a satellite communications system. Forecasts were developed for the following traffic segments: scheduled passenger, non-scheduled passenger; scheduled and non-scheduled military air charter, all cargo service, and general aviation. The forecasts were further disaggregated to indicate the type of aircraft equipment used and were developed for 1975, 1980 and 1985. The study required the development of a detailed data base for route segment traffic by category. A variety of economic forecasting techniques were used to analyze this data base and to make the forecasts. A unique method of dual forecasting and reconciliation was used to forecast the more important categories of air traffic. Author

N74-33415# National Aeronautical Lab., Bangalore (India).
[RESEARCH AND DEVELOPMENT PROGRAMS ON AERODYNAMICS, ELECTRONICS, INSTRUMENTATION, PROPULSION, AND STRUCTURAL SCIENCES] Annual Report, 1972 - 1973
1973 112 p refs
Avail: NTIS HC $8.75

Concise data is presented which summarize research, important results, and future plans for work conducted by scientists in Bangalore, India. Topics are covered under the headings of aerodynamics, propulsion, structural and materials science, electronics, instrumentation, and mathematics. Cases of technology transfer and collaboration with industry and universities are cited. A.A.D.

N74-33416*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ENERGY IMPACT OF SHORT-HAUL STOL SYSTEMS
Elwood C. Stewart Jul. 1974 20 p refs
(NASA-TM-X-62356) Avail: NTIS HC $3.00 CSCL 05C

An analysis has been made to evaluate the impact on fuel requirements of a segregated short-haul system. A comparison has been made between two alternate scenarios: one with STOL, and the other without STOL. For the New York to Washington, D.C. city pair the results show: (1) the modal efficiency approach, while indicating the with STOL scenario requires more fuel than the without STOL scenario, is of questionable validity because it does not account for various effects which exist in realistic scenarios; (2) evaluation of fuel requirements based on more detailed modeling indicates that while a STOL scenario requires more fuel than without STOL when an idealized CTOL system is postulated, the STOL scenario requires less fuel than without STOL when the CTOL system has even moderate delays. These results are due to a combination of effects: the closer and more convenient locations of STOL ports to the traveler, congestion at the CTOL airports, and the impact of the through passenger traffic. Sensitivity of results to STOL aircraft block fuel and to CTOL congestion delays are considered. Author

N74-33417*# Washington Univ., St. Louis, Mo.
CENTER FOR DEVELOPMENT TECHNOLOGY AND PROGRAM IN TECHNOLOGY AND HUMAN AFFAIRS
Mike D. Wong Aug. 1974 321 p refs
(Grants NGR-26-008-054; NSE EC-38871)
(NASA-CR-140016; R(T)-74/3; THA-74/5) Avail: NTIS HC $19.25 CSCL 05K

The role of technology in nontraditional higher education with particular emphasis on technology-based networks is analyzed nontraditional programs, institutions, and consortia are briefly reviewed. Nontraditional programs which utilize technology are studied. Technology-based networks are surveyed and analyzed with regard to kinds of students, learning locations, technology utilization, interinstitutional relationships, cost aspects, problems, and future outlook. Author

N74-33418# Atomic Energy Commission, Washington, D.C.
FUEL TRANSPORTATION, DISTRIBUTION, AND STORAGE Subpanel report 3 used in preparing the AEC chairmans report to the President
J. H. Seelinger 13 Nov. 1973 163 p
(WASH-1281-3) Avail: NTIS HC $11.25

Pipelines, ocean delivery systems, large nuclear underground fuel transportation, distribution, and storage (TDS), and hydrogen TDS were considered for research and development funding, but were abandoned for a more limited program designated the ship delivery system. Recommended funding was set at $50 million over a five year fiscal period. The expected achievements of the ship delivery system are discussed and include the following: (1) detailed design of Arctic surface tankers suitable for transporting oil from certain regions of the Arctic to U. S. East Coast ports safely and economically; (2) detailed design and advanced components for Arctic submarine tankers for use where pipelines and surface tankers are not feasible; (3) detailed design of Arctic marine terminals, both surface and submerged, followed by feasibility demonstration; and (4) acceptance, commitment, and participation in these programs by commercial operators on the basis of established technology and economic desirability. NSA

N74-33419# Atomic Energy Commission, Washington, D.C.
RESOURCE ASSESSMENT Subpanel report 1 used in preparing the AEC chairmans report to the President
T. H. McCulloh 13 Nov. 1973 147 p
(WASH-1281-1) Avail: NTIS HC $10.50

The United States will be primarily dependent for its energy needs upon oil and gas, coal, uranium and hydropower well into the next century. Domestic sources of these supplies will be taxed to the utmost during the 1973-85 period. Options involving different energy mixes, different levels of energy production, and varying environmental and socio-economic impacts may be permitted in the long term by technological progress. However, the necessary decisions regarding such options cannot now be made intelligently without a much better understanding of the domestic energy fuel resource base. Resolution of the energy crisis, which is basically a domestic fuel shortage, will depend primarily on increasing conventional fuel supplies. More effective means for the discovery, evaluation, and development of these supplies are needed. Since the cited fuels and hydropower will remain the prime domestic energy sources for many decades, it is essential to recognize that each is characterized by unique features of availability, usability, and environmental acceptability. They are only partly interchangeable as fuels and more complete interchangeability will require the restructuring of many industrial processes. Author (NSA)

N74-33420# California Univ., Livermore. Lawrence Livermore Lab.
ELEMENTS OF THE WORLD ENERGY CRISIS
G. C. Werth and E. Green 14 Jan. 1974 31 p refs Presented at Watchtower-74 Meeting, Moelos, Mexico, 18-20 Jan. 1974; Sponsored by Banco Nacional de Mexico
(Contract W-7405-eng-48)
(UCID-16428) Avail: NTIS HC $4.75

The chain of events leading to the world energy crisis is followed for each industrialized country and the effects that energy shortages are presenting and options that are available are identified. The Soviet Union has extensive oil and gas reserves and the U.S.A. has extensive fossil fuel reserves, but needs to develop technology for coal and shale. Western Europe has been dependent upon Middle East oil, but could develop their coal resources. Japan is dependent upon oil imports, and with the advanced prices of oil, the capital on that island needs to be used internally in improving living conditions. NSA

N74-33421# Pennsylvania State Univ., University Park. Transportation and Traffic Safety Center.
MANAGERIAL RESOURCES AND PERSONNEL PRACTICES IN URBAN MASS TRANSPORTATION
Ray A. Mundy and John C. Spychalski Nov. 1973 321 p Sponsored by DOT
(PB-231433/4; TTSC-7317; UMTA-PA-11-0010-73-1) Avail: NTIS HC $7.25 CSCL 05I

The primary purpose of this project was to identify and evaluate policies, practices and other conditions relating to the supply of managerial personnel in the urban mass transit industry. The supply, conducted during 1972-1973, sought to provide information concerning the following: an inventory of management, technical, and supervisory personnel in the industry; a current profile of management and technical personnel; a summary of personnel practices and training methods now being used in the industry; an assessment of manpower demand and supply in the industry by administrative levels; and a review of the roles of UMTA, universities and the industry in improving the training of personnel in the transit industry with respect to training methods, course contents, level of support for trainees and related matters. GRA

N74-33422# Teledyne Brown Engineering, Huntsville, Ala. Military Systems Div.
A COMPUTER SIMULATION TO DETERMINE KINEMATIC INTERCEPTOR PERFORMANCE
W. M. Langley Dec. 1973 99 p refs
(Contract DAHC60-73-C-0017)
(AD-781003; MSD-74-ABMDA-1784) Avail: NTIS CSCL 15/3

The equations of motion describing an interceptor engaging an exoatmospheric target were derived and programmed into a computer simulation. The simulation (KIP-kinematic interceptor performance) is capable of determining interceptor preliminary performance requirements in terms of relative geometry and required velocity. Engagement constraints, such as baffle angle and radar horizon, are considered. A description of the KIP simulation is included in the Appendices. Author (GRA)

N74-33423# Air Force Systems Command, Washington, D.C.
AIR FORCE SYSTEMS COMMAND RESEARCH OBJECTIVES
1 Apr. 1974 234 p refs
(AD-781376; AFSC-TR-74-01) Avail: NTIS CSCL 14/2

Desired objectives are given for Air Force research activities in support of seven technology areas. Author (GRA)

N74-33424# CACI, Inc., Arlington, Va.
NAVY AIRLIFT MODEL (NAVLIFT) USER'S MANUAL Final Report, FY 1974
Joyce D. Maillart and James H. Wilson Jan. 1974 78 p
(Contract N00019-74-C-0178)
(AD-780230; WSAO-R-742) Avail: NTIS CSCL 15/7

The NAVLIFT Model was developed to support the Navy Airlift Study, a study of projected airlift forces. This manual describes the system simulated and the information developed by the model; algorithms and decision logic input format necessary to run the model on IBM-360 computer. The model is used for analyses of alternative strategies in unscheduled airlift operations. Its use can be extrapolated to any transportation system that operates on demand and that calls for spherical point-to-point navigation between terminals. Author (GRA)

N74-32516* Kanner (Leo) Associates, Redwood City, Calif.
WHO OWNS THE MOON?
G. P. Zhukov *In its* Inhabited Space, Pt. 2 (NASA-TT-F-820) Jul. 1974 p 177-184 Transl. into ENGLISH from the book "Naselennyy Kosmos" Moscow, Nauka Press, 1972 p 358-361
(For availability see N74-32500 22-04)
CSCL 05D

SPECIAL NOTICE

REVISED NTIS PRICING SCHEDULE

The National Technical Information Service (NTIS) has adopted the following single domestic price schedule to replace its previous schedules in which reports in stock were priced separately from those which had to be reproduced on demand.

Page Range	*Price*	*Page Range*	*Price*	*Page Range*	*Price*
001-025	$3.25	201-225	$7.25	401-425	$10.50
026-050	3.75	226-250	7.50	426-450	11.25
051-075	4.25	251-275	8.50	451-475	11.50
076-100	4.75	276-300	8.75	476-500	12.00
101-125	5.25	301-325	9.25	501-525	12.25
126-150	5.75	326-350	9.50	526-550	12.50
151-175	6.25	351-375	10.00	551-575	13.00
176-200	7.00	376-400	10.25	576-600	13.25

Add $2.00 for each additional 100-page increment from 601 to 1000 pages; add $4.00 for each additional 100-page increment over 1000 pages.

Add $2.50 per copy to each price for foreign surcharge.

THESE PRICES APPLY RETROACTIVELY TO ALL REPORTS IN THE NTIS COLLECTION, INCLUDING ALL REPORTS ANNOUNCED IN *STAR* THROUGH ISSUE 24 OF 1974.

Before ordering copies from NTIS, users should recalculate the price according to the above table, using the page numbers shown in the citation. Note that many documents have been lowered in price. The table may be used for both NASA and non-NASA reports announced in *STAR* as available from NTIS. A few reports will continue to be specially priced. These include certain NASA continuing bibliographies, a few Technology Utilization products, and publications of organizations for which NTIS is a sales agency. Specially priced reports will usually be apparent from the significant discrepancy between the citation sales price shown and the schedule price. These reports are exceptions to the retroactive application of this price change and will continue to be purchasable at the price shown until further notice.